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DEPARTMENTS

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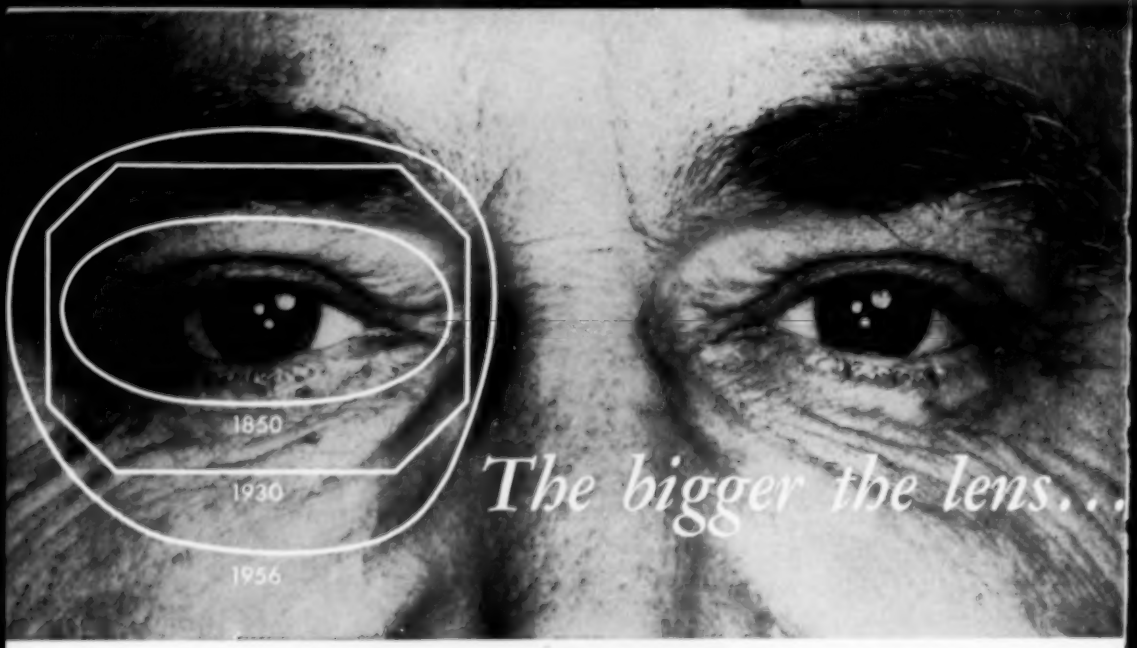

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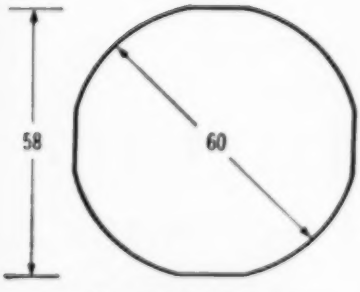

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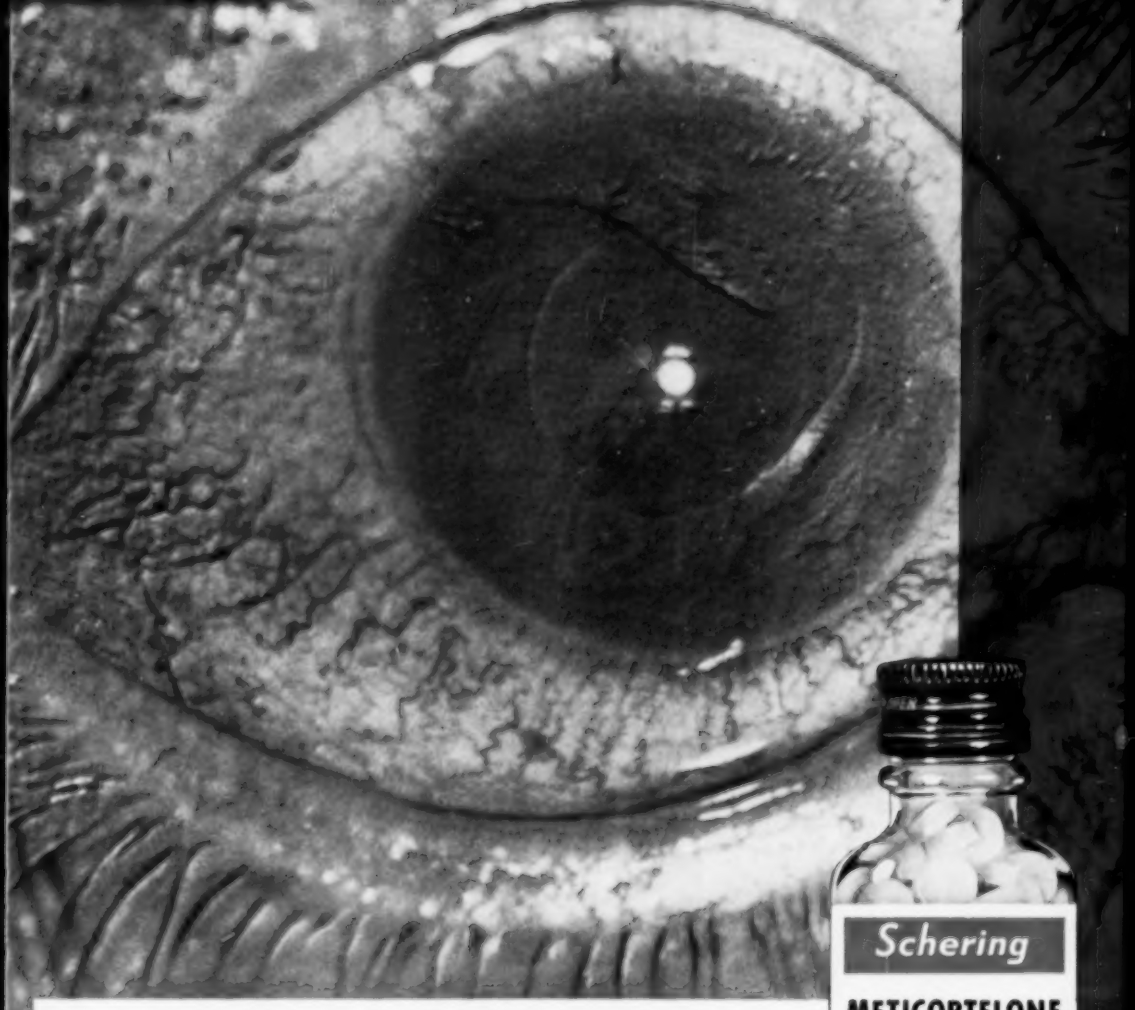

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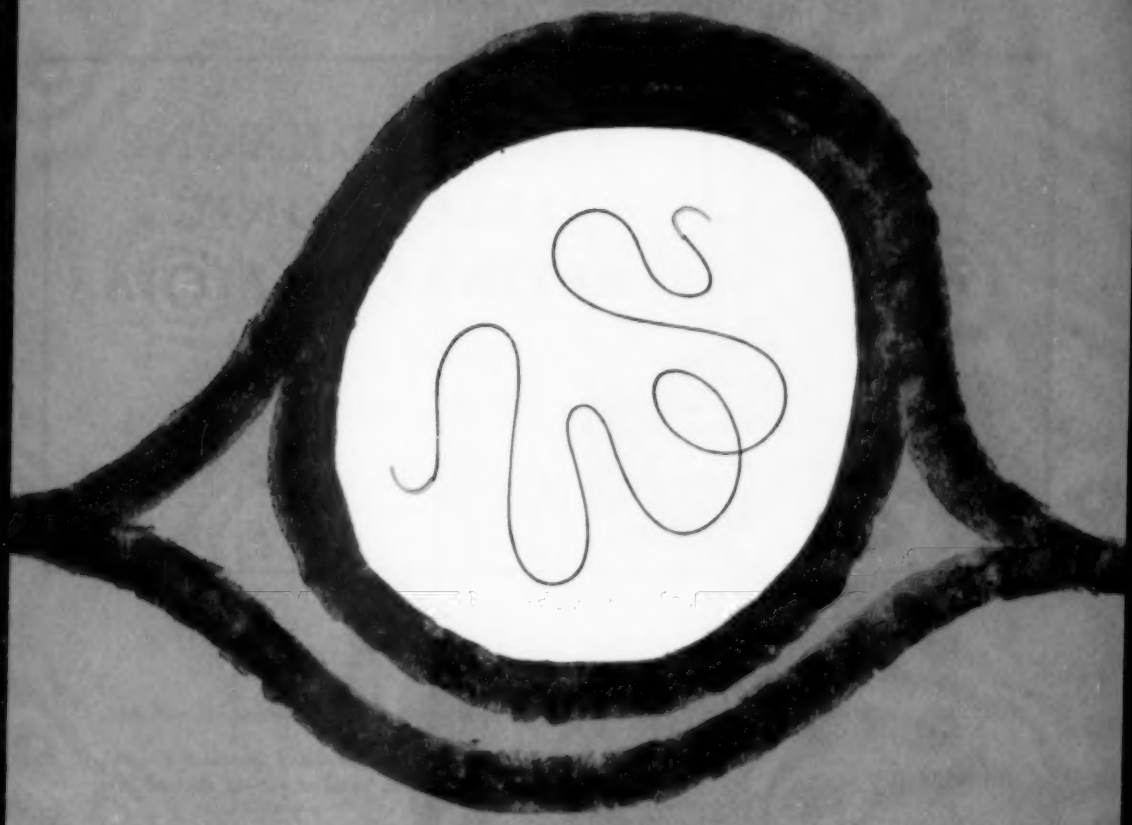

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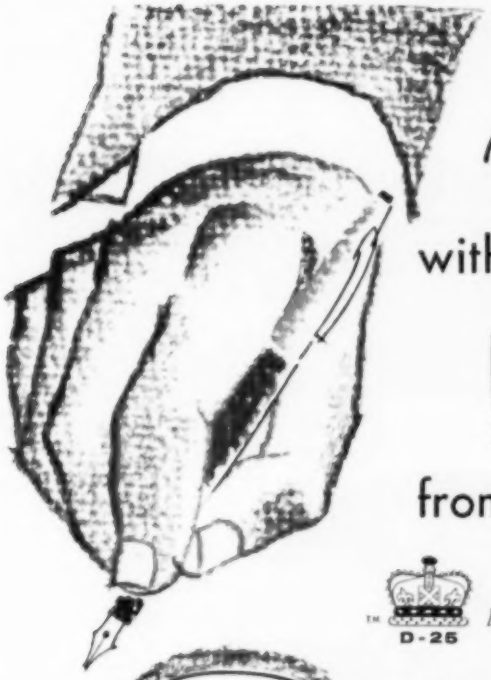

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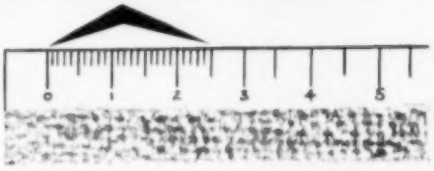

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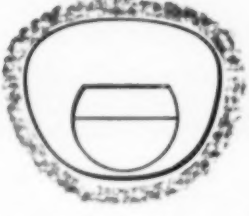

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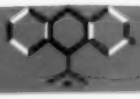

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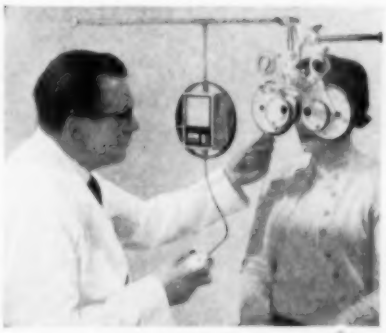

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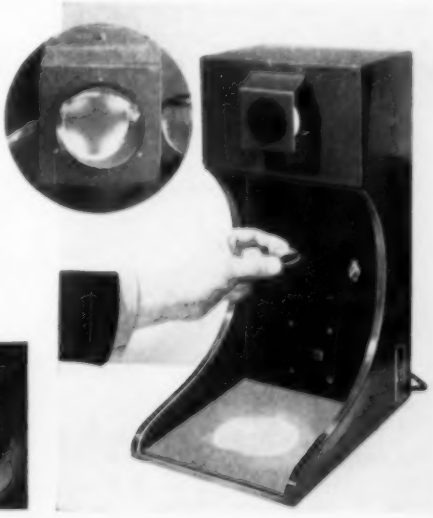

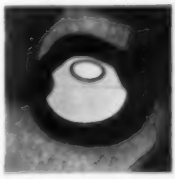

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CASE HISTORY – Mr. F. S.

Mr. F.S., a 55-year-old businessman, had been aware of a gradual and painless reduction of his visual acuity for more than a year. Examination revealed cataractous changes in each lens, particularly marked in the posterior subcapsular cortex. Corrected right vision = 6/200; corrected left vision = 20/80. As this vision did not permit him to carry on with his duties, a right intracapsular lens extraction was performed on February 18, 1955. Post-operative course was uneventful and the patient was discharged on February 25th.

3-18-55: Manifest O.D. +10.50Dsph ○ +0.50Dcyl. ax 165 = 20/20–; +2.75D add = Jg. 0.75 @ 12½". Rx Right: Manifest findings in CATAREX T (temporary style) straight-top bifocal. Left: lens to balance.

4-12-55: Right vision with above CATAREX T lens = 20/40+. Manifest O.D. +10.50Dsph. ○ +1.50Dcyl. ax 105 = 20/15+; +2.75D add = Jg. 0.75 @ 13". Patient was allowed to retain first CATAREX T lens until second pair was received with new Rx.

5-5-55: Right vision with 4-12-55 Rx = 20/20. Manifest O.D. +10.00Dsph. ○ +1.50Dcyl. ax 105 = 20/15+. Again, patient was allowed to retain former lens until the new Rx in CATAREX T was ready.

5-31-55: Right vision with 5-5-55 Rx = 20/50. Manifest O.D. +10.00Dsph. ○ +1.00Dcyl. ax 60 = 20/15+. Rx Right: Manifest findings in CATAREX T. Left: lens to balance.

7-6-55: Right vision with 5-31-55 Rx = 20/20+. Manifest O.D. +10.00Dsph. ○ +1.00Dcyl. ax 75 = 20/15+. Rx Right: Manifest findings in CATAREX T. Left: lens to balance.

7-27-55: Manifest O.D. +10.50Dsph. ○ +1.25Dcyl. ax 90 = 20/15+; +2.75D add = Jg. 0.75 @ 13¾". Rx Right: CATAREX D (permanent). Left: lens to balance.

1-18-56: With permanent CATAREX D lens, right vision = 20/15+; Jg. 0.75 at 13".

The patient, who secured his first CATAREX T (temporary) bifocal lens one month after surgery and had five different Rxes in temporary lenses, secured his first and only permanent lens, CATAREX D, approximately five months after surgery; to date he has not had to have it changed or re-surfaced. Thus, the maximum visual acuity of which the eye was capable was made available to the patient during the greater part of the post-operative period by frequent changes of CATAREX T lenses as indicated, and finally by the permanent CATAREX D lens. With this lens, the patient is most comfortable ocularly at his work and contemplates having his left cataract extracted in the near future.

AMERICAN JOURNAL OF OPHTHALMOLOGY

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AMERICAN JOURNAL OF OPHTHALMOLOGY

VOLUME 42 NOVEMBER, 1956 NUMBER 5

GLAUCOMA AND THE SUPERIOR VENA CAVAL OBSTRUCTION SYNDROME*

JOSEPH E. ALFANO, M.D., AND PAUL A. ALFANO, M.D.
Chicago, Illinois

Obstruction of the superior vena cava was first described by William Hunter[1] in 1757, and since that time multiple reports have appeared in the literature. However, a survey of the ophthalmic literature reveals only two communications wherein ocular signs and symptoms have been described associated with this disorder. One case was reported by Brolin[2] in 1949 and another by Bedrossian[3] in 1952.

The etiologic factors responsible for obstruction of the superior vena cava, include aortic aneurysms with or without arteriovenous fistula, thoracic neoplasms either primary or secondary, mainly the former, or more rarely, miscellaneous conditions such as chronic cicatrizing mediastinitis, enlarged hilar lymph nodes, or intrathoracic goiter. The pathologic entity producing this condition is always in the right thorax because of the anatomic situation of the superior vena cava.

The venous drainage of the ocular structures is of considerable importance in these cases. According to Duke-Elder,[4] the venous return is by three routes: the vortex veins, the anterior ciliary veins and the posterior ciliary veins. The vortex veins carry most of the blood from the iris and ciliary body, and the whole of that from the choroid. The venous return from the iris and ciliary body unites with that from the choroid which leaves the eye through the four vortex veins which run obliquely through the sclera in canals four to five mm. in length. The two superior vortex veins enter the superior orbital vein and the two inferior enter the inferior orbital vein.

According to Duke-Elder[4] "the anterior ciliary veins drain the anterior part of the ciliary muscle and pierce the sclera near the limbus in canals which run almost vertically. In the sclera these vessels form the intrascleral plexus, with which the canal of Schlemm is directly associated; then, when they emerge from the sclera, they gather the branches of the episcleral plexus which drains the marginal plexus of the cornea and the episcleral tissue, finally entering the orbital veins."

The posterior ciliary veins drain the posterior region of the sclera.

The superior vortex vein and the orbital veins enter the superior ophthalmic veins which enter into the cavernous sinus. The inferior ophthalmic vein receives orbital veins and the two inferior vortex veins. The inferior ophthalmic vein divides into two branches, the upper division which usually drains either into the cavernous sinus or the superior ophthalmic vein and a lower division, which may be absent, and which empties in the pterygoid plexus, the latter, which by way of the internal maxillary vein, empties into the external jugular vein. The central retinal vein empties either into the superior or inferior ophthalmic veins or the cavernous sinus directly. The cavernous sinus empties via the superior and inferior petrusal sinuses into the internal jugular vein.

* From the Departments of Ophthalmology and Surgery, The Northwestern University Medical School.

The bulk of the blood from the head is drained by the internal jugular and a relatively small amount from the external jugulars. A small portion returns via the suboccipital plexus into the vertebral and deep cervical veins and from there into the innominate veins.

Systemic signs and symptoms

The symptoms of obstruction of the superior vena cava are the result of venous hypertension in the region normally drained by this vessel. These symptoms however will vary in severity depending upon the degree and location of obstruction and upon the extent of development of collaterals. The most apparent physical signs are the engorged venous pattern and cyanosis in the upper one-half of the body. The veins in the upper extremities, head, neck, and chest are dilated and prominent and exhibit an increased venous pressure as compared with the pressure in the lower extremities. Varying degrees of cyanosis of the head, neck, trunk, and upper extremity are seen.

In acute obstructions, marked edema of the face and neck may occur, but edema is not as striking in the slowly progressive, more chronic obstructions, in which there has been time for the development of extensive collateral circulation.

When the obstruction is below the azygos vein, which largely drains the intercostal venous system, the collateral pathway from the head is blocked and a marked dilatation of the superficial veins of the chest is seen.

All symptoms are intensified with recumbency. Many patients have dyspnea, orthopnea, and periodic bouts of hyperventilation, the latter of which are thought by some to be due to an increased intracranial pressure with tissue stasis of the brain. The increased intracranial pressure may give rise to headache, stupor, somnolence, vertigo, mental changes, and convulsions.

Ocular signs and symptoms (table 1)

In the case reported by Brolin,[2] of a 72-year-old white man, with a superior vena caval obstruction syndrome secondary to a carcinoma of the lung on the right side, the external examination of the eyes was normal as were the fundi except for some peripapillary retinal edema and engorgement of the retinal veins. Visual fields including the blindspots were normal. The ocular tension with the patient seated measured 18 to 20 mm. Hg (Schiøtz) in each eye. With the patient in the recumbent position, the pressure rose to 35 mm. Hg in each eye.

Bedrossian[3] reported a case, in a 66-year-old white man, resulting from a mass in the mediastinum. The patient showed edema of the upper and lower lids of both eyes with slight conjunctival injection. Examination of the fundi revealed blurring of the disc margins with obliteration of the optic cup. The fundal veins were somewhat fuller than normal. The ocular pressure measured 35 mm. Hg in the right and 42 mm. Hg (Schiøtz) in the left eye. The pressure could be controlled with the use of pilocarpine drops.

Case reports (tables 1 and 2)

Case 1

This was the case of a 61-year-old white man, with an obstruction of the superior vena cava of three to five days' duration, as the result of a mediastinal tumor, thought to be lymphomatous in nature. Examination revealed a somewhat apprehensive white man who was sitting up almost perpendicularly in bed, because of his dyspnea, as evidenced by his labored breathing. Visual acuity was not obtainable. There was a distention of the veins of the neck, thorax, and upper extremity.

Examination of the eyes revealed a two-plus edema of the upper and lower lids of both eyes with some edema of the conjunctiva. The edema gave the patient the so-called "pumpkin-head" appearance. Both eyes showed some distention of the episcleral veins. The corneas were clear, the pupils equal and regular, and reacted normally to light and accommodation. Corneal sensation was normal in both eyes. Examination of the fundi revealed the discs to be of good outline and color with physiologic optic cupping. Only a very faint pulsation of the central retinal veins was seen on the nerveheads. No exudates or hemorrhages were present. No pathologic cupping of the nerveheads was seen. There was a grade two sclerosis of the retinal arteries with only minimal evidence of retinal vein engorgement.

The ocular pressure at this time measured 34.7 mm. Hg (Schiøtz) in the right and 30.3 to 34.7 mm. Hg (Schiøtz) in the left eye.

At this time the blood pressure was 100/70 mm. Hg; urine and Wassermann were negative. Venous pressure in the upper extremities measured 365 mm. H_2O, and the red blood cell count was four million.

He was seen 48 hours later and the condition appeared the same, excepting in the semisitting position the ocular pressure measured 23.4 mm. Hg (Schiøtz) in each eye. The patient was then changed from the sitting to the recumbent position. The patient usually objected to becoming recumbent because it markedly accentuated his dyspnea. Upon assuming the reclining position the cyanosis of the upper extremities and head was increased and there was an increase in the prominence of the veins of the head, neck, and upper extremities. The eyes appeared to become more prominent in the lying position and the eyes appeared to become more congested due to distention and filling up of the episcleral veins. The upper lid became more prominent due to dilation of the superior orbital veins. Upon being returned to the upright position these phenomena of congestion were relieved. The tension rose from 23.4 mm. Hg (Schiøtz) in each eye in the sitting position to 32.3 mm. Hg in the reclining position.

Exophthalmometer reading in the upright position measured:

$$\frac{\text{O.D.} = 24\text{ mm.} - \text{O.S.} = 22.5\text{ mm.}}{95\text{ (base line)}}$$

To study the effect of pilocarpine on the ocular tension and the exophthalmos, two drops of freshly prepared one-percent pilocarpine were instilled into each eye and the patient was continually observed until it was felt that miosis although not present was about to appear and then the ocular tension and exophthalmometer readings in the sitting and upright positions were measured.

The ocular tension after the instillation of pilocarpine in the sitting position fell to 16.9 mm. Hg (Schiøtz) in each eye and to 26.5 mm. Hg in each eye in the recumbent position. The exophthalmometer reading in the sitting position was:

$$\frac{\text{O.D.} = 21\text{ mm.} - \text{O.S.} = 20.5\text{ mm.}}{95\text{ (base line)}}$$

while in the recumbent position, the exophthalmometer readings measured:

$$\frac{\text{O.D.} = 23\text{ mm.} - \text{O.S.} = 22\text{ mm.}}{95\text{ (base line)}}$$

Re-examination several days later, after three doses of X-ray therapy to the mediastinum, revealed the tension in the upright position measured 16.9 mm. Hg (Schiøtz) in each eye. Changing the patient to the recumbent position raised the pressure to 26.5 mm. Hg (Schiøtz) in each eye.

One week later, after six treatments of deep roentgen therapy to the mediastinal lymphomatous mass, he was re-examined and the following phenomena were evident:

There was a marked reduction in the edema of the lids and there was no more narrowing of the palpebral fissure. The congestion of the conjunctiva and engorgement of the episcleral vessels were no longer visible. Ocular rotations were normal and no distention of the retinal veins was present. In the semisitting position the ocular tension measured 11.9 mm. Hg (Schiøtz) in each eye, while in the recumbent position the pressure rose to 23.4 mm. Hg in each eye. The exophthalmometer readings in the upright position measured:

$$\frac{\text{O.D.} = 21\text{ mm.} - \text{O.S.} = 20\text{ mm.}}{95\text{ (base line)}}$$

while in the reclining position measured:

$$\frac{\text{O.D.} = 23\text{ mm.} - \text{O.S.} = 22\text{ mm.}}{95\text{ (base line)}}$$

Upon placing the patient from the upright to the reclining position, a mild cyanosis of the upper extremities and head returned along with some congestion of the conjunctiva and episcleral veins. Upon rotation of the head to either side, there was no change in the degree of exophthalmos. After the instillation of pilocarpine, the tension remained 10 mm. Hg in the semireclining position and was raised to 16.9 mm. Hg in the recumbent position.

Upon re-examination 10 days later, the external appearance of the face and eyes was unchanged. The ocular tension in the upright position measured 11.9 mm. Hg (Schiøtz) in each eye. The exophthalmometer reading in the upright position measured:

$$\frac{\text{O.D.} = 21\text{ mm.} - \text{O.S.} = 20\text{ mm.}}{95\text{ (base line)}}$$

and in the recumbent position measured:

$$\frac{\text{O.D.} = 23\text{ mm.} - \text{O.S.} = 21\text{ mm.}}{95\text{ (base line)}}$$

After the instillation of one-percent pilocarpine in each eye and checking the pressure just before the appearance of miosis, the tension in the upright position measured 10 mm. Hg (Schiøtz) in each eye and in the reclining position measured 20.1 mm. Hg in the right and 14.6 mm. Hg in the left eye. The exophthalmometer reading in the upright and reclining positions remained unchanged from the respective readings obtained before the instillation of the one-percent pilocarpine drops.

The reduction of the intraocular pressure following radiation of the lymphomatous mediastinal mass with subsequent relief of the superior vena caval obstruction is significant.

Case 2

This was the case of a 54-year-old white man, who was admitted to the hospital for surgical removal of a carcinoma of the right lung. The pa-

tient complained of a chronic cough with hemoptysis and demonstrated a shadow on X-ray examination of the chest, indicative of a bronchogenic carcinoma of the right lung.

Preoperative examination revealed that, although the visual acuity was not obtainable, with his present correction the patient was able to read newspaper print with each eye. There was edema of the upper and lower lids of both sides with narrowing of the fissures. There was also some edema of the face giving the appearance of "mooning of the face."

In the upright position there was a moderate distention of the conjunctival and episcleral vessels. The cornea were clear and the pupils were both miotic measuring 1.5 mm. because the patient had received an injection of 0.25 gr. of morphine sulfate, to quiet him, shortly before he was examined. The extraocular muscles were normal. The optic nerveheads showed some blurring, suggestive of an early edema of the discs. The fundus veins appeared darker than usual and only slightly distended. No exudates or hemorrhages were seen.

In the upright (semireclining position) the ocular tension measured 34.7 mm. Hg (Schiøtz) in each eye in spite of the morphine miosis. The patient was transferred from the semireclining to the reclining position. The latter position induced some apprehension and dyspnea. There was some cyanosis of the head and upper extremities and distention of the veins of the neck and temple areas. The "mooning of the face" became more apparent. The conjunctival and episcleral veins became more prominent. Although exophthalmometer readings were not taken, the eyes appeared more prominent in the reclining than in the upright or semireclining position.

After the patient had been recumbent for 15 minutes, the ocular tension was taken and was found to measure 53.61 mm. Hg (Schiøtz) in the right eye and over 60 mm. Hg in the left eye. In the reclining position, after 15 minutes, the sclera developed a marked deep blue hue resembling the blue sclerotics seen in patients with osteogenesis imperfecta. Thoracotomy with biopsy verified the diagnosis of bronchogenic carcinoma of the right lung with invasion of the mediastinum, and mediastinal adenopathy with pericardial infiltration.

The patient was seen several days later, the morphine now having been discontinued. The findings were unchanged excepting the pupil size was 4.0 to 4.5 mm. in each eye and reacted to light. Exophthalmometer readings taken in the upright position, using the Luedde exophthalmometer, measured O.D., 22 mm.; O.S., 18 mm.

The ocular tension in the semirecumbent position measured 29.6 mm. Hg (Schiøtz) in each eye. After being recumbent for 10 minutes the tension rose to over 61.9 mm. Hg in the right eye and to 53.3 mm. Hg Schiøtz in the left eye. Two drops of one-percent pilocarpine were instilled into each eye and the tension checked just before the appearance of miosis and there was found to be no change in the intraocular pressure in both the sitting and upright positions. Re-checking the pressure after the appearance of miosis revealed no change in the ocular pressure in either the upright or recumbent position. Re-examination of the fundus revealed blurring of the discs with venous engorgement suggestive of an early papilledema.

CASE 3

This was the case of a 51-year-old Negress. She was admitted to the hospital with the complaint of swelling of the neck and right arm and of the face, associated with a persistent "cold and hoarseness." Her throat continually felt dry and there were no ocular complaints. Physical examination was noncontributory except for some swelling of the face covering the maxillary and mandibular areas and some swelling of the right side of the neck and the right arm. There was a marked distention of the veins of the neck and arms. Blood pressure was recorded as 150/90 mm. Hg.

Fluoroscopy of the chest revealed a widening of the superior vena caval shadow. Roentgen examination of the chest revealed a widening of the inferior portion of the mediastinum with triangular densities (masses) extending to the right and to the left of the superior mediastinum into the back of the neck. Biopsy of one of these masses later confirmed the diagnosis of Hodgkins' disease.

Ocular examination revealed a visual acuity of *20/20* in each eye, with correction. In the upright and semireclining position the lids and fissures were normal, as were the conjunctiva and cornea. The pupils were equal and regular and reacted normally to light and to accommodation. Extraocular muscles were normal.

Examination of the fundi revealed normal discs with a normal vascular pattern. There was no distention of the retinal veins and no hemorrhages or exudates were seen. Ocular tension in the upright position measured 32.3 mm. Hg (Schiøtz) in each eye. Exophthalmometer readings in the upright position measured:

$$\frac{\text{O.D.} = 20\text{ mm.} - \text{O.S.} = 20\text{ mm.}}{96\text{ (base line)}}$$

Immediately upon being placed in the horizontal position, the distention of the veins of the neck and upper extremities became more marked as did the conjunctival and episcleral veins. Checking the ocular pressure immediately after assuming the horizontal position revealed it to be 34.7 to 40.0 mm. Hg (Schiøtz) in the right and 34.7 mm. Hg in the left eye.

After having been in the reclining position for 10 minutes the ocular pressure was re-checked and was found to measure 40.0 mm. Hg in each eye.

Exophthalmometer readings at this time measured:

$$\frac{\text{O.D.} = 22\text{ mm.} - \text{O.S.} = 22\text{ mm.}}{96\text{ (base line)}}$$

Upon returning the patient to the semirecumbent position and immediately checking the ocular pressure, it was found to measure 34.7 mm. Hg in the right and 30.3 mm. Hg in the left eye.

Confrontation visual fields were normal. Central visual fields were normal and there was no enlargement of the blindspot.

The patient was examined 24 hours later and the tension in the upright position was found to be 30.3 mm. Hg (Schiøtz) in each eye in the upright position and rose to 34.7 mm. Hg in each eye in the horizontal position. Two drops of one-percent pilocarpine were instilled into each eye and the ocular tension was measured at just the time it was felt a miosis was beginning. At this time the tension in the upright position was reduced to 28.3 mm. Hg (Schiøtz) in the right and 24.6 mm. Hg in the left eye. In the horizontal position the tension again rose to 34.7 mm. Hg (Schiøtz) in each eye. The tension was then re-checked after the pupil had constricted by the pilocarpine to two mm. in each eye. The tension at this time measured in the vertical position 28.3 to 30.3 mm. Hg. In the horizontal position, at this time, the pressure measured 30.3 to 34.7 mm. Hg in the right and 34.7 mm. Hg in the left eye.

In this patient the venous pressure in the right arm measured 560 mm. of saline (normal = 120 mm.). The Decholin circulation in the right arm measured 25 seconds, and the ether circulation time measured 22 seconds. The venous pressure in the left arm measured 360 mm. and the Decholin circulation time measured 30 seconds.

The venous pressure in the right leg measured 220 mm. of saline.

CASE 4

This was the case of a 52-year-old white man with a verified bronchogenic carcinoma of the right lung which had extended into and involved the mediastinum. There were no ocular complaints and visual acuity measured 20/30 in the right eye and 20/25 in the left eye. There was no edema of the lids and the fissures were normal. There was no engorgement or dilation of the conjunctival or episcleral veins although there was a prominence of the veins of the lateral wall of the orbit and of the neck veins. Pupils were equal and regular and reacted normally to light and to accommodation. Examination of the fundi revealed normal discs with no glaucomatous cupping. The vascular pattern was not remarkable and there was no evidence of venous engorgement or retinal exudates or hemorrhages.

Peripheral confrontation fields were normal. Central fields were normal. Slitlamp examination revealed no clear aqueous veins in either eye. There were a few mixed aqueous carrying veins in the right, and many in the left eye. The exophthalmometer readings measured:

$$\frac{\text{O.D.} = 15\text{ mm.} - \text{O.S.} = 14\text{ mm.}}{85\text{ (base line)}}$$

in the upright position, and in the reclining position measured:

$$\frac{\text{O.D.} = 18\text{ mm.} - \text{O.S.} = 15\text{ mm.}}{85\text{ (base line)}}$$

The ocular tension in the semiupright position measured 32 mm. Hg (Schiøtz) in the right eye and 30 mm. Hg in the left eye. In the horizontal position the intraocular pressure measured 40 mm. Hg in each eye. Two drops of two-percent pilocarpine were instilled in each eye and the ocular tension measured just before miosis appeared. At this time the pressure in the upright position measured 25 mm. Hg in the right eye and 22 mm. Hg in the left eye. In the reclining position the pressure measured 30 to 35 mm. Hg in each eye.

The venous pressure in the right arm measured 440 mm. saline, and in the left arm 500 mm. The ether circulation time measured 17 seconds. The magnesium sulfate circulation time measured 30 seconds.

CASE 5

This was the case of a 52-year-old Negro with a diagnosis of a lymphoma of the mediastinum. The patient had no particular visual complaints although he did notice some blurring upon watching television and when reading.

Uncorrected visual acuity measured 20/20 in each eye. There was a mild edema of the upper lids of both eyes with some narrowing of the fissures. The conjunctival vessels appeared normal although there was slight engorgement of the episcleral veins. Pupils were equal and regular and reacted normally to light and accommodation. There was some prominence of the veins of the neck and of the veins surrounding the orbit.

Examination of the fundi revealed normal discs with no glaucomatous cupping. There was some engorgement of the retinal veins but no exudates or hemorrhages were present. Peripheral and central fields were normal.

Exophthalmometer readings measured:

$$\frac{\text{O.D.} = 18\text{ mm.} - \text{O.S.} = 20\text{ mm.}}{95\text{ (base line)}}$$

and in the reclining position measured:

$$\frac{\text{O.D.} = 18\text{ mm.} - \text{O.S.} = 22\text{ mm.}}{95\text{ (base line)}}$$

Ocular tension in the upright position measured 30 mm. Hg (Schiøtz) in the right and 22 mm. Hg in the left eye. In the reclining position the tension measured 40 mm. Hg in the right and 34.7 mm. Hg in the left eye. Two drops of two-percent pilocarpine were instilled into each eye and the ocular tension was measured before miosis of the pupil became evident. After the pilocarpine, the tension in the upright position measured in the right eye 24.6 mm. Hg and in the left eye 17.1 mm. Hg (Schiøtz). In the reclining position, the ocular tension measured 30 mm. Hg in the right and 28.3 mm. Hg in the left eye.

The venous pressure measured 380 mm. saline in the right arm, and in the left measured 370 mm. saline. The magnesium sulfate circulation time measured eight seconds in each arm.

CASE 6

This was the case of a 52-year-old white man with a carcinoma of the right lung with extension into the mediastinum. In the upright position the patient showed edema of the face, neck, and upper one half of the thorax with cyanosis of the face, lids, lips, and conjunctiva. The left supraorbital vein was dilated as were the veins of the neck and thorax. There was only mild engorgement of the conjunctival and episcleral veins.

The cornea were clear and the pupils were equal and regular and reacted normally to light and accommodation. Although measurements were not taken the right eye appeared more prominent than the left eye.

Fundus examination revealed normal discs with no evidence of glaucomatous cupping. There was some distention of the retinal veins but no hemorrhages or exudates were present.

In changing the patient from the upright position to the reclining position the patient exhibited some respiratory distress. The cyanosis of the lids and face and upper extremities became more marked, as did the distention of the conjunctival, episcleral, and neck veins. There was also distention of the veins surrounding both orbits, although there was no change in the central retinal veins. Although measurements were not taken, the eyes appeared more prominent in the reclining than in the upright position. Ocular tension in the upright position measured 25.4 mm. Hg (Schiøtz) in each eye and rose to 34.7 mm. Hg (Schiøtz) in each eye upon placing the patient in the reclining position. Pilocarpine was not instilled.

DISCUSSION

The ocular signs seen in these patients (table 1) include edema of lids and conjunctiva, prominence of the periorbital, conjunctival, and episcleral veins, and a prominence of the globes or small degree of exophthalmos, nonpulsating in nature. Pupillary reactions and ocular muscle balance are usually normal. The fundi usually show some evidence of venous engorgement and may show some blurring of the disc margins. The ocular tension in the upright or semireclining position may be either normal or elevated and become much more elevated when the patient is placed in the recumbent position. The signs appear to be more marked on the right side and are all aggravated by placing the patient in the reclining position. The tension may be reduced by the instillation of pilocarpine drops. All the signs appear to be the direct result of obstruction of the superior vena cava by the mediastinal mass which interferes with the venous drainage from the eye and orbit.

The glaucoma in these cases must likewise be considered secondary in nature, that is, secondary to the venous obstruction. It has been known for some time that obstruction of the aqueous veins, episcleral veins, vortex veins, orbital veins, or obstruction of the cavernous sinus can be associated with a rise in the intraocular pressure. In this re-

TABLE 1

OCULAR SIGNS AND SYMPTOMS

Case No.	Prominence of Globes	Edema of Lids and Conjunctiva		Venous Engorgement		Vision		Pupils		Fundus Examination					
										Veins		Discs		Fields	
		O.D.	O.S.	O.D.	O.S.	O.D.	O.S.	O.D.	O.S.	O.D.	O.S.	O.D.	O.S.	O.D.	O.S.
1	+	2+	2+	+	+	N.D.	N.D.	N	N	±	±	N	N	N.D.	N.D.
2	+O.D. Only	3+	3+	2+	2+	RNP	RNP	M	M	+	+	SB	SB	N.D.	N.D.
3	+ Recumbent Position Only	+	0	0	0	20/20	20/20	N	N	0	0	N	N	PCN CN	PCN CN
4	0	0	0	0	0	20/30−	20/30+	N	N	0	0	N	N	PCN P.C.	PCN C.D.
5	+O.S. Recumbent Position Only	+	+	+	+	20/20	20/20	N	N	+	+	N	N	NPCF	NPCF
6	+O.D.	3+	3+	2+	2+	N.D.	N.D.	N	N	+	+	N	N	N.D.	N.D.

KEY: N—Normal
N.D.—Not Done
RNP—Reads News Print
M—Miotic Due to Morphine
SB—Slightly Blurred
PCN—Peripheral Confrontation Field Normal
CN—Central Field Normal
NCPF—Normal Peripheral and Central Fields

gard, Sondermann[5] felt that the normal intraocular pressure is the result of venous stasis in the eye for which the oblique exit of the vena vorticose is mainly responsible. He felt that the pressure in the vena vorticose and in the veins and capillaries in the uvea was the power which created the intraocular pressure, whereas, the production and drainage of aqueous merely provided for fine adjustments and for the maintenance of ophthalmotonus. He felt that the vortex veins were actually canals four to five mm. in length which formed a valvelike exit channel.

According to Duke-Elder,[4] if the venous pressure is altered, other things being equal, the intraocular pressure varies directly with it. For example, upon increasing the venous pressure by tying off the vortex veins as they emerge from the eye, very high intraocular pressures varying up to 80 or 90 mm. Hg can be recorded. This elevation of pressure will necessarily vary with the species of animal and the efficiency of the anastomic channels between the anterior ciliary and the vorticose veins. He goes on further to state that a similar rise may occur after ligation of the veins at the back of the orbit or by the obstruction of the venous return by retrobulbar injections, hematomas, or masses, as well as in exophthalmic conditions.

The equivocal results on the ocular tension which occur following ligation or compression of the jugular veins are due to the freely anastomic channels which these veins possess. However, when these veins and all their anastomic channels are simultaneously ligated, or when a ligature is passed around the neck, or compression of the abdomen or thorax or obstruction of the superior vena cava occurs, the elevation of the intraocular pressure is usually marked.

Meyer[6] states that when proliferative endophlebitis of the jugular veins with stenosis of the lumen occurs, there results an increased venous pressure in all the distal veins including the episcleral veins, with a resulting interference with the drainage of fluid from the anterior chamber and subsequent elevation of the intraocular pressure.

According to Schoenberg,[7] Schulze, in 1907, showed that, if a rubber band were applied to the neck of a rabbit, the intraocular pressure rose from 18 to 35 mm. Hg in two minutes. He further states that Hiriaski, in 1924, showed that if an isotonic suspension of fine carbon particles were introduced into the anterior chamber of a rabbit having a normal ocular pressure, the carbon particles will appear in Schlemm's canal and in the episcleral vessels. He further showed that obstruction of the jugular veins stopped the drainage of these particles from the anterior chamber and cited this as evidence that obstruction of the jugular veins interfered with the outflow of aqueous from the anterior chamber.

Schoenberg[7] showed that if an ordinary blood pressure cuff is made to encircle the neck and the ocular tension is measured before and after the cuff is inflated anywhere from 20 to 80 mm. Hg, there will be, in all cases, a rise in the intraocular pressure.

Weekers and Delmarcelle[8] feel that the venous pressure, at the point where the aqueous veins join the conjunctival and episcleral veins, is an important factor in the regulation of the intraocular pressure. To prove this they presented the case of a patient with an arteriovenous aneurysm between the internal carotid artery and the cavernous sinus on one side only. The patient showed a raised intraocular pressure in the affected eye only. In this case they recorded the rate of aqueous flow, the resistance to the outflow of aqueous, and the pressure in the episcleral veins. They showed that the increased pressure in the episcleral veins was responsible for the glaucoma in this case, for the aqueous flow and the resistance to aqueous outflow were normal.

According to Thomassen,[9] it has been known for a long time that a rise in the intraocular pressure can follow venous obstruction in the eye. He states that, in 1867, Adamuch showed that the intraocular pressure could be greatly increased by ligating the vorticose veins. Bartels (1905) pro-

duced the same effect by the ligation of the anterior ciliary veins. Wessely (1908) and Bonnefon (1922) obtained the same result by constriction of the throat vessels and Comberg and Stoewer (1925) by compression of the abdomen.

Adler[10] states that, if the venous return from the head is blocked, the intraocular pressure rises enormously by damming the return flow of blood back into the eye, all of the blood vessels dilate to a maximum, and the intraocular pressure increases to the highest values found under pathologic conditions.

In reviewing the pressure reading (table 2) in Case 1, it was found that the initial pressure reading in the semirecumbent position measured 34.7 mm. Hg (Schiøtz) in the right eye and 30.3 to 34.7 mm. Hg in the left eye. Twenty-four hours later the intraocular pressure was rechecked and in the semirecumbent position was found to measure 23.40 mm. Hg in each eye. After placing the patient in the recumbent position, the ocular tension rose to 32.31 mm. Hg in each eye. The instillation of pilocarpine reduced the intraocular pressure to 16.9 mm. Hg in each eye with the patient in the semireclining position.

At this point several factors should be considered:

Although the intraocular pressure measured 23.4 mm. Hg at the time the tension was rechecked, the tension rose to 32.3 mm. Hg after the patient was placed in the reclining position. Also the fall of the intraocular pressure following shrinking of the lymphomatous mediastinal mass, with relief of the superior vena caval obstruction, is a priori evidence that this obstruction was responsible for the elevated intraocular pressure.

In Case 2 (table 2), the intraocular pressure readings in spite of the morphine induced miosis measured 34.7 mm. Hg (Schiøtz) in the semiupright position and rose to 53 to 61.9 mm. Hg in the right and to over 60 mm. Hg in the left eye. The ocular tension was uninfluenced by the instillation of pilocarpine (one percent) drops before or after the appearance of miosis.

In Case 3 (table 2), the initial intraocular pressure in the semirecumbent position measured 32.3 mm. Hg (Schiøtz) in each eye and rose to 40.0 mm. Hg in each eye upon assuming the recumbent position. That patient was rechecked 24 hours later and the intraocular pressure in each eye in the semirecumbent position was found to measure 30.3 mm. Hg in each eye and rose to 34.7 mm. Hg in each eye upon placing the patient in the recumbent position. Rechecking the tension after the instillation of pilocarpine in the upright and recumbent positions, before and after the appearance of miosis, showed failure to lower the intraocular pressure.

In Case 4 (table 2), the initial intraocular pressure measured 32 mm. Hg (Schiøtz) in the right and 30 mm Hg in the left eye.

TABLE 2

RESULTS OF STUDY OF INTRAOCULAR PRESSURE

Case No.	Initial Pressure				Pressure after Pilocarpine before Miosis				Pressure after Pilocarpine after Miosis			
	Semireclining		Reclining		Semireclining		Reclining		Semireclining		Reclining	
	O.D.	O.S.	O.D.	O.S.	O.D.	O.S.	O.D.	O.S.	O.D.	O.S.	O.D.	O.S.
1	23.4	23.4	32.3	32.3	16.9	16.9	26.5	26.5	—	—	—	—
2	29.6	29.6	over 61.9	53.3	29.6	29.6	over 61.9	53.3	29.6	29.6	over 61.9	53.3
3	30.3	30.3	34.7	34.7	28.3	24.6	34.7	34.7	28.3–30.3	24.6	30.3–34.7	34.7
4	32.0	30.0	40.0	40.0	25.0	22.0	30.0	90.0	—	—	—	—
5	30.0	22.0	40.0	34.7	24.6	17.1	30.0	28.3	—	—	—	—
6	25.4	25.4	34.7	34.7	—	—	—	—	—	—	—	—

In the recumbent position the intraocular pressure rose to 40 mm. Hg in each eye. After the instillation of pilocarpine, the pressure in the right eye was reduced to 25 mm. Hg and 22 mm. Hg in the left eye in the upright position. In the reclining position, the intraocular pressure was reduced to 30 to 35 mm. Hg in each eye.

In Case 5 (table 2) the initial intraocular pressure in the upright position measured 30 mm. Hg (Schiøtz) in the right and 22 mm. Hg in the left eye. In the reclining position, the ocular tension rose to 40.0 mm. Hg in the right and 34.7 mm. Hg in the left eye. After the instillation of pilocarpine, the pressure in the upright position measured 24.6 mm. Hg in the right eye and 17.1 mm. Hg in the left eye. In the reclining position after the instillation of pilocarpine the intraocular pressure in the right eye measured 30 mm. Hg and 28.3 mm. Hg in the left eye.

In Case 6 (table 2) the initial intraocular pressure measured 25.4 mm. Hg (Schiøtz) in each eye and rose to 34.7 mm. Hg in each eye after placing the patient in the recumbent position.

As seen in Table 2 in each of these six patients, upon assuming the reclining position, there was a rise in the intraocular pressure of from 7.7 mm. Hg (Case 3) to 27.2 mm. Hg (Case 2). It is well known in these cases that by placing the patient in the recumbent position there is further embarrassment to the return flow of blood from the head with a resultant accentuation of signs and symptoms, due to venous congestion.

Duke-Elder[11] states that in the venous congestion test for glaucoma, by lowering the head of the patient or constricting the neck, a rise in tension tends to occur. In this test, the ocular tension is taken before the test commences, and rechecked after congestion has been maintained for one hour. An increase of more than six mm. Hg (Schiøtz) is considered pathologic. In the cases reported here, the rise in intraocular pressure occurred almost immediately after the patient had been placed in the horizontal position. These same findings also pertain in regard to the decubitus provocative test for glaucoma as described by Kollmer and Thibert, who felt that if a patient is made to lie down, particularly with the head low, a rise in the intraocular pressure of six mm. Hg (Schiøtz) was indicative of glaucoma.

Can the response in Cases 1 to 5 (table 2) of the intraocular pressure to the local instillation of pilocarpine be used to shed further light on the antiglaucomatous effects of pilocarpine? In Case 1, the ocular tension was reduced by the instillation of miotics 5.5 mm. Hg (Schiøtz) in the upright position and 5.8 mm. Hg in the horizontal position. In Case 2, the instillation of pilocarpine had no effect on the intraocular pressure in either the semirecumbent or recumbent positions.

In Case 3, the intraocular pressure was reduced two mm. Hg (Schiøtz) in the upright and 5.7 mm. Hg in the recumbent position. In Case 4, the intraocular pressure was reduced seven to eight mm. Hg in the upright position, and 10 mm. Hg in the recumbent position. In Case 5, the intraocular pressure was reduced 4.9 mm. to 5.4 mm. Hg in the upright position and 6.4 mm Hg in the recumbent position.

It should be emphasized that when measuring the tension in the upright position every effort was made to have the eye looking straight up with the Schiøtz tonometer lying perpendicularly on the center of the cornea.

In all of these cases, it should be emphasized that, with the exception of Cases 2 and 3, in which the ocular tension was measured before and after the appearance of miosis, all pressure readings taken after the instillation of pilocarpine were taken at a time when it was felt that miosis was about to appear. This was done in an effort to rule out the effects of miosis upon lowering the intraocular pressure. Unfortunately, excepting for Cases 2 and 3, ocular tension readings for comparisons were not taken

after the appearance of miosis.

There are at present many schools of thought concerning the action of pilocarpine. According to Duke-Elder[11] the miotics may reduce the intraocular pressure by (1) combating vascular stasis and edema and (2) by miosis. He states that, owing to the vasodilatation that these drugs tend to produce in normal eyes, they tend to produce a rise in the intraocular pressure, but in the circulatory stasis of glaucoma, the reaction is reversed and the state of nutrition improved.

In regard to the miotic effect, he feels that the contraction of the iris mechanically increases the efficiency of the drainage angle by opening it out. In addition the contraction of the ciliary muscles on the scleral spur opens out the angle and the canal of Schlemm. Also the miosis increases the absorptive surface of the iris as well. He also feels that the contraction of the ciliary muscle fibers which surround the long posterior ciliary arteries, much like a sphincter, by their contraction, tends to occlude these arteries keeping down the blood pressure in the anterior segment and by opening up the choroidal veins helps overcome stasis.

Prijot and Weekers[12] suggest that the action of pilocarpine may be due to an increased drainage in the venous outflow through the scleral plexus, resulting in a significant drop in the resistance to aqueous outflow which they felt was due chiefly to a dilatation of the intrascleral venous plexus which drains the canal of Schlemm and partly to opening of the trabecular spaces by the contraction of the ciliary muscle.

In a discussion of this subject, Cristini[13] first refutes the idea of von Hipple and Gruenhagen, who felt that uveal vasodilatation is always followed by a rise in the intraocular pressure. Cristini feels that while this may apply to the larger arterioles, this does not necessarily apply to the capillaries, and probably the reverse is true. He showed that pilocarpine and eserine caused a vasodilatation and an increase in the size of the capillary bed. He felt that this led to an increased peripheral resistance with a resultant reduction in the filtration force due to a reduced hydrostatic pressure and therefore a fall in the intraocular pressure. Although he does not state so, it would seem that this fall in pressure was the result of a reduced output of aqueous. He felt that this mechanism could substantiate the concepts of Gala and Theil who showed that in glaucomatous eyes after the instillation of miotics, sodium iodide (Gala) and fluorescein (Thiel), the outflow of these drugs into the aqueous was lessened. I believe that recent studies with tonography have shown that in glaucoma the addition of miotics has almost no effect on the aqueous inflow but rather increases the coefficient of facility of outflow.

In further regard to this matter, Thomassen[9,14] has shown that the venous tension in the episcleral veins is high in proportion to the bulbar pressure when the ocular tension is in the ascending phase and low in proportion to the bulbar tension when the intraocular pressure is in a decreasing phase. He showed that when pilocarpine is instilled into an eye with an elevated intraocular pressure, a fall in the episcleral venous pressure usually preceded the fall in the intraocular pressure on the average by 15 minutes.

According to Thomassen,[15] Ascher has shown that pilocarpine produces a considerable increase in the clear liquid running through the aqueous veins. This is perceptible before any change in the size of the pupil can be observed. Thomassen, who had shown in his earlier work that pilocarpine first acts by reducing the pressure in the episcleral veins, disagrees with Ascher who felt that this increased flow in the aqueous was due to an increased pressure in the aqueous veins.

Bedrossian,[3] in his case report, cites the fact that since the glaucoma in his case was controlled by miotics the pressure-reducing effect of the miotic must have been due to its effect upon the ocular circulatory system.

It would appear that in these cases of glaucoma, associated with obstruction of the superior vena cava, the increased venous pressure dams as far back as the intrascleral venous plexus and increases the resistance to aqueous outflow. This would have to be verified by tonographic studies. Assuming this to be correct, then it would not be unreasonable to assume that pilocarpine reduced the pressure in the episcleral veins. This reduction of venous pressure in the episcleral veins would be followed almost simultaneously by a fall in pressure in the intrascleral venous plexus. The fall in pressure in the intrascleral venous plexus would result in a diminished resistance to outflow of aqueous and with a resultant increase in the coefficient of facility of outflow which would lead to a fall in the intraocular pressure.

In Cases 2 and 3, where there was no appreciable drop in the intraocular pressure, we can assume that although the pilocarpine had reduced the pressure in the episcleral veins, this reduction was not of sufficient degree, in these cases, to reduce the resistance to aqueous outflow and hence the intraocular pressure remained constant.

The prominence or even the exophthalmos of the globes that is present in these cases undoubtedly is the result of venous stasis and congestion in and around the orbit; as is the periorbital and conjunctival edema.

Summary

Obstruction of the superior vena cava due to a mediastinal mass may produce a multiplicity of ocular signs and symptoms. These include edema of the lids, face, and conjunctiva; engorgement and dilatation of the veins of the face, neck, conjunctiva, episclera, and fundus; prominence of the globes; or an overt exophthalmos, edema of the discs, and glaucoma. These signs and symptoms are all accentuated in placing the patient from the upright to the recumbent position.

The glaucoma is bilateral and usually gives rise to no subjective complaints. The intraocular pressure may or may not be elevated in the upright or semireclining position, but always rises upon placing the patient in the recumbent position. There was no pathologic cupping of discs and the central visual fields in these cases reported were normal. Some reduction in the intraocular pressure may be brought about by the instillation of pilocarpine. The mechanism of action of the miotics in reducing the intraocular pressure in glaucoma of this type is discussed.

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THE EFFECT OF ULTRASONIC RADIATION

Upon the eye and ocular adnexa

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This paper is the first in a series reporting observations on the effects of ultrasonic radiation on the eye and ocular adnexa. In this paper the gross and microscopic findings will be described. Future papers will deal with associated effects such as heating, intraocular-pressure changes, and the effects on the rate of blood absorption from the vitreous.

Ultrasonic waves are sound waves with a frequency greater than 20,000 cycles per second. Because of the larger number of excellent technical papers[1-3] on the physical, chemical, and biologic actions of ultrasound, only those special aspects which make application and evaluation of the effects of ultrasonic radiation so difficult need be mentioned. It is impossible to transmit sound of this frequency from the piezo-electric transducer to the tissue through air. This necessitates the use of a coupling medium such as oil or degassed water. The multicurved surfaces about the eye, and the uneven distribution of the sound energy on the transducer emitting surface, combine to introduce many dosage problems. To surmount this obstacle, a number of techniques have been devised to facilitate irradiation.[4-13] The details of the various techniques explored during these experiments are reported elsewhere.

The objective of the present paper was to determine the dosage range which may be employed about the eye. Therefore, the experiments in this report were performed using a direct coupling technique which introduces the smallest number of variables. In this technique, the ultrasonic applicator (technically termed a transducer) is placed directly upon the eye which is coated with petrolatum or some other oily coupling medium.

The principal disadvantages of this method are that a limited area of contact results because a flat surface is being applied to the spherical eyeball. (Curving the transducer surface to conform to the shape of the eye would focus the sound beam and produce a point of excessive energy.) Secondly, the sound amplitude is three to four times greater at the center of the transducer face than at the periphery, and it is difficult to align the same two points consistently.

An Ultrasonor Model No. 33 was used for these experiments. This ultrasonic generator is specifically constructed for medical use. It has the following characteristics: Energy density 0.25, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0 watts per square centimeter; the total sound output equivalent was equal to 1.25, 2.5, 5.0, 7.5, 10.0, 12.5, and 15.0 watts; the frequency is 1,000 kc. (one million cycles per second); the impulse ratio was 1:5, 1:10, and 1:20, that is the generator delivers power for one

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fifth of a second and is off for four-fifths second, for one tenth of a second and off for nine-tenths second, and so forth.

To standardize this unit and to determine the effects of the various types of coupling techniques, the output of this unit was tested on a Siemens Sonotest. The latter determines the sound output expressed as watts of sound energy delivered to a fixed quantity of water.

The wattage per square centimeter is the theoretical value obtained by dividing the total wattage by five, which represents the five square centimeters of the surface area of the crystal. Actual observation of a column of water placed in the field of the sound head shows a turbulence at the center of the crystal many times that of the edge, as measured by the height of the column of water. This indicates the greater energy concentration in the center of the crystal. It is this uneven distribution of the sound energy which accounts for the variable results obtained by the use of ultrasonic radiation. Specifically, if during the radiation of an eye, the eye should at one time be in contact with the periphery of the transducer, and at another time with the center of the transducer, then the actual intensity of ultrasonic energy delivered to the eye would be much greater in the latter instance even though the total output of the generator remained the same. Since minor variations in ultrasonic energy can cause severe ocular damage, the output from the center of the transducer is the crucial determinant, and must never exceed the "safe" tissue dose.

The output of the ultrasonic generator varied with fluctuations in the line voltage. This was corrected by a constant voltage and a variable voltage transformers as indicated in Figure 1. The resultant power output from the ultrasonic generator was essentially constant after the unit had been permitted to stabilize.

When the sound output was pulsed or other techniques of coupling were employed, the energy delivered to the "Siemens Sonotest" was decreased.

Material

There were 17 rabbits in which 34 eyes were subjected to ultrasonic radiation. The irradiation was given in seven different power ranges (table 1). These eyes were irradiated by interposing petrolatum between the cornea and the treatment head. Both acute and long-term experiments were performed in the various power ranges. Following a course of irradiation, the eyes were removed under anesthesia and placed in a fixative; then the animal was killed. Where pertinent, lid and chiasmal sections were prepared. After gross and microscopic study showed no alterations in the low-power ranges, a few additional animals were exposed and then used for other experiments. They are not included in this paper.

Method

Under nembutal anesthesia the eyes of normal rabbits were exposed to dosages of ultrasonic radiation listed in Table 2.

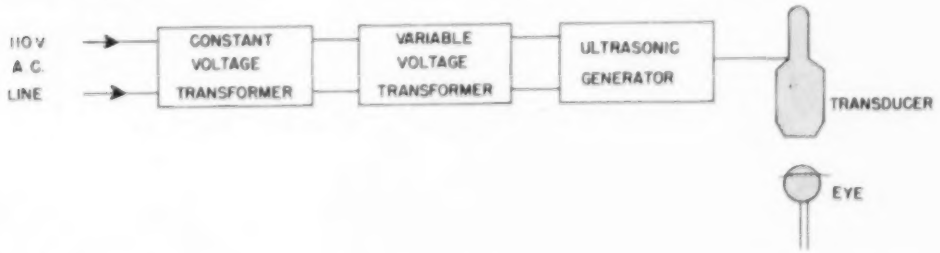


Fig. 1 (Baum.) Block diagram of circuits used to produce a stabilized output from ultrasonic generator.

TABLE 1

MATERIAL

Power/cm.²	3.0 W/cm.²	2.5 W/cm.²	2.0 W/cm.²	1.5 W/cm.²	1.0 W/cm.²	0.50 W/cm.²	0.25 W/cm.²
Eye No.	4–54 O.U.	3–54 O.D.	42 O.D.	16–51 O.D.	14–51 O.S.	77 O.S.	77 O.D.
	6 O.S.	42 O.S.	14–51 O.D.	82 O.D.	6–51 O.S.	7–51 O.S.	21–51 O.D.
	151 O.S.	43 O.D.	6–51 O.D.	79 O.S.	79 O.D.	30 O.D.	
	351 O.S.	44 O.S.	41 O.D.	81 O.D.	82 O.S.	27 O.D.	
	84 O.D.	7–51 O.D.	3–54 O.S.	45 O.U.	84 O.S.	27 O.S.	

TABLE 2

OBSERVATIONS

Power/cm.²	Exposure Time (min.)	Coupling	Eye No.	No Damage	Reversible Damage	Permanent Damage	Total Time	Remarks
0.25	10	D	77 O.D.	+				
0.25	5	D	77 O.D.	+				
0.25	10	D	77 O.D.	+				
0.25	10	D	77 O.D.	+			35 min.	
0.25	1	D	21–51 O.D.	+				
0.25	3	D	21–51 O.D.	+				
0.25	5	D	21–51 O.D.	+				
0.25	10	D	21–51 O.D.	+			10 min.	
0.5	10	D	77 O.S.	+				
0.5	5	D	77 O.S.	+				
0.5	10	D	77 O.S.	+				
0.5	10	D	77 O.S.	+			35 min.	
0.5	3	D	7–51 O.S.	+				
0.5	5	D	7–51 O.S.	+				
0.5	10	D	7–51 O.S.	+				
0.5	10	D	7–51 O.S.	+				
0.5	10	D	7–51 O.S.	+			38 min.	
0.5	5	D	30 O.D.*	+			60 min.	*Each eye received 12 exposures of 5 min. duration each, for a total of 60 min.
0.5	5	D	27 O.D.*	+			60 min.	*Each eye received 12 exposures of 5 min. duration each, for a total of 60 min.
0.5	5	D	27 O.S.*	+			60 min.	*Each eye received 12 exposures of 5 min. duration each, for a total of 60 min.
1.0	3	D	14–51 O.S.	+				
1.0	3	D	14–51 O.S.	+				
1.0	5	D	14–51 O.S.	+			11 min.	
1.0	1	D	6–51 O.S.	+				
1.0	3	D	6–51 O.S.	+				
1.0	5	D	6–51 O.S.	+				
1.0	10	D	6–51 O.S.		±			
1.0	10	D	6–51 O.S.		±		29 min.	
1.0	5	D	79 O.D.	+			5 min.	

TABLE 2—*(continued)*

Power/ cm.²	Exposure Time (min.)	Coupling	Eye No.	No Damage	Reversible Damage	Permanent Damage	Total Time	Remarks
1.0	5	D	82 O.S.	+				
1.0	5	D	82 O.S.	+			10 min.	
1.0	5	D	84 O.S.	+			5 min.	
1.5	3	D	16–51 O.D.	+				
1.5	5	D	16–51 O.D.	+				
1.5	10	D	16–51 O.D.			+	18 min.	No damage produced by 5 min. application but extensive damage at 10 min.
1.5	5	D	82 O.D.		±		5 min.	
1.5	7	D	79 O.S.		+		7 min.	
1.5	3	D	81 O.D.		+		3 min.	
1.5	3	D	45 O.D.		+		3 min.	
1.5	5	D	45 O.S.		+		5 min.	
2.5	1	D	3–54 O.S.	+				Painful-stopped treatment
2.0	5	D	3–54 O.S.		+			
2.0	5	D	3–54 O.S.		+			
2.0	5	D	3–54 O.S.		+			
2.0	5	D	3–54 O.S.		+			
2.0	5	D	3–54 O.S.		+			
2.0	5	D	3–54 O.S.		+		31 min.	
2.0	5	D	42 O.D.		+			
2.0	5	D	42 O.D.		+			
2.0	5	D	42 O.D.			+*	15 min.	*The transducer was hot from prior operation. This is the probable cause of this unusual response
2.0	1	D	14–51 O.D.	+				
2.0	3	D	14–51 O.D.		±			
2.0	3	D	14–51 O.D.		±			
2.0	5	D	14–51 O.D.		+			
2.0	5	D	14–51 O.D.		+		17 min.	
2.0	1	D	6–51 O.D.	+				
2.0	3	D	6–51 O.D.		±			
2.0	5	D	6–51 O.D.		+			
2.0	10	D	6–51 O.D.			+	19 min.	Prolonged exposure at 2.0 W/cm.² will produce irreversible damage
2.0	5	D	41 O.D.			+	5 min.	Acute experiment hence irreversibility cannot be evaluated
2.5	5	D	3–54 O.D.			+		
2.5	1.5	D	3–54 O.D.		+			
2.5	5	D	3–54 O.D.			+		
2.5	5	D	3–54 O.D.			+		
2.5	5	D	3–54 O.D.			+		
2.5	5	D	3–54 O.D.			+		
2.5	5	D	3–54 O.D.			+	36.5 min.	
2.5	5	D	42 O.S.			+		
2.5	5	D	42 O.S.			+		
2.5	5	D	42 O.S.			+		
2.5	5	D	42 O.S.			+	20 min.	
2.5	5	D	43 O.D.			+	5 min.	

TABLE 2—(*continued*)

Power/ cm.²	Exposure Time (min.)	Coupling	Eye No.	No Damage	Reversible Damage	Permanent Damage	Total Time	Remarks
2.5	5	D	44 O.S.			+		
2.5	3	D	44 O.S.			+	10 min.	
2.5	3	D	7–51 O.D.			+		
2.5	5	D	7–51 O.D.			+		
2.5	10	D	7–51 O.D.			+++	18 min.	
3.0	5	D	4–54 O.D.			+		*No further damage noted following bag coupling but injury from preceeding Rx persisted
3.0	5	D	4–54 O.D.			+		
3.0	5	D	4–54 O.D.			+	15 D	
3.0	5	B	4–54 O.D.	+*				
3.0	5	B	4–54 O.D.	+				
3.0	5	B	4–54 O.D.	+			15 B Total 30 min.	
3.0	5	B	4–54 O.S.	+			10 B	
3.0	5	B	4–54 O.S.	+				
3.0	5	D	4–54 O.S.			+	15 D	
3.0	5	D	4–54 O.S.			+	Total 25 min.	
3.0	5	D	4–54 O.S.			+		
3.0	1.5	D	6 O.S.	+				
3.0	90 sec.	D	6 O.S.	+				
3.0	90 sec.	D	6 O.S.	+			4.5 min.	
3.0	1	B	151 O.S.		+			
3.0	1	D	151 O.S.		+			
3.0	15-P 1:5*	D	151 O.S.		+			*Pulsed 1:5 ratio
3.0	10	B	151 O.S.		+			
3.0	3	D	151 O.S.			+	30 min.	
3.0	3	D	351 O.S.			+	3 min.	
3.0	5	D	84 O.D.			+	5 min.	Autopsied lids and globe 24 hr. after exposure

D—Direct petrolatum.
B—Rubber condom coated with petrolatum.
F—Funnel filled with degassed water or 0.25-percent methyl cellulose.
L—Via lids.

Prior to exposure, each animal's eyes were examined with the slitlamp and with the ophthalmoscope. Examinations were repeated immediately after exposure, during the recovery phase, and immediately prior to autopsy.

Observations

Three types of responses were noted:

1. Irreversible effects, produced by a range of 2.5 W-3.0 W/cm.² for 5 min. by direct petrolatum coupling.

2. Reversible changes, produced by powers of 1.5 W-2.0 W/cm² for 5 min. by direct petrolatum coupling.

3. No destructive effect produced by 0.25 W/cm.²/5 min.-1.0 W/cm.² for 5 min. by direct petrolatum coupling.

Observation of gross effects

A. Irreversible changes

Dose: 2.5-3 W/cm.²/5 min.—single application.

The lids. Hair: epilation of hair. Skin: burning of the skin with erythema, exuda-

tion, and crusting, resulting in eventual severe cicatrization and cicatricial ectropion (fig. 2).

Conjunctiva: Immediately following exposure there was a subconjunctival hemorrhage in which the capillaries seemed to have been ruptured and a film of blood lay extravasated under the conjunctiva. This was later followed by scar tissue formation. The eyeball was proptosed, the orbital tissues were warm to touch, the ocular tension was elevated to both fingers and tonometry. The limbus was congested and the paralimbal vessels were dilated. The cornea was frequently opaque at the point of contact with the transducer. The iris, in spite of the elevated tension, was miotic. This occurred even in the presence of atropine mydriasis. The anterior chamber showed a marked flare to slitlamp examination. (Because of corneal haze, it was impossible to distinguish cells or adequately study the fundus.)

B. Reversible changes

Dose: 1.5-2.0 W/cm.²/5 min. In this range nearly all the changes noted were milder and reversible.

Skin: Hair epilation if the sound source was applied to the same area for five minutes. Conjunctiva: variable, from no effect to vascular engorgement; but no hemorrhages. No permanent damage. Cornea: occasional transient opacity. Limbus: paralimbal vascular congestion. Tension: slightly elevated or normal and the eyeball might be slightly proptosed. Slitlamp: flare (unable to distinguish cells because of corneal haze). Fundus: (unable to distinguish because of corneal haze).

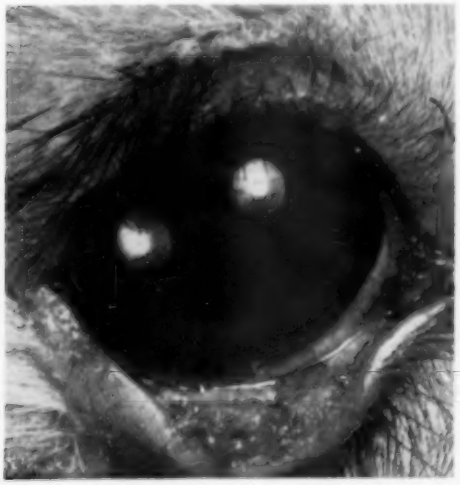


Fig. 2 (Baum). Cicatricial ectropion and corneal leukoma following excessive ultrasonic radiation.

C. "Safe" range—0.25 W/cm.²/5 min.-1.0W/cm.²/5 min.

The only observable effect appeared to be paralimbal injection, slight warmth of the orbital tissues, and a flare observable with the slitlamp. All changes were reversible.

Microscopic changes

The following histologic changes were observed in the 2.5 watt to 3.0 watt per square centimeter group. All changes were primarily limited to the anterior segment of the eye. These consisted of limbal infiltration, vascular dilatation and congestion, as well as exudate in the anterior chamber, and occasional anterior and/or posterior synechias. The iris, ciliary body, and processes were edematous and engorged. Some sections exhibited stromal hemorrhages.

Figure 3 is a low power photomicrograph of the limbus and cornea of an eye exposed to 3.0 watts of ultrasonic energy/cm.² for five minutes upon three successive occasions. The limbal area is infiltrated by many lymphocytes and eosinophils. Occasional polymorphonuclear cells were noted. The corneal stroma was edematous and exhibited vascularization. Figure 4, a higher magnification of the same section, shows these changes plus early scar tissue formation as represented by the appearance of a few fibroblasts. Some of the sections showed exudate in the anterior chamber and angle, as well as corneal precipitates.

Marked edema of the iris, many stromal hemorrhages, and posterior synechias are shown in Figure 5. Some sections had an-

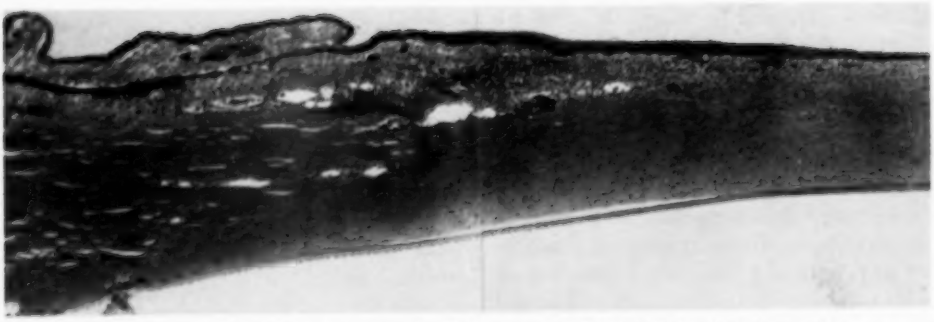


Fig. 3 (Baum). Limbus and cornea of rabbit eye exposed to 3.0 W/cm.²/5 min. on three successive occasions (×140).

terior synechias as well. Maximum injury occurred in the zone which lay in the path of the central cone of rays from the transducer.

Figure 6 is a photomicrograph of the adhesion of the iris and ciliary process following injury by ultrasonic energy. (In the rabbit ciliary, the processes normally arise from the posterior surface of the iris.) A higher power of a similar section (fig. 7) shows disruption of pigment cells, hemorrhage, and adhesion of the injured ciliary process to the iris.

The lens immediately adjacent to the posterior synechias showed microscopic changes which could not be observed by direct, ophthalmoscopic, or slitlamp examination. The remainder of the lens appeared normal.

Fig. 4 (Baum). High-power view of Figure 3.

Fig. 5 (Baum). Section of iris and lens in the path of the central ultrasonic cone. Note changes in the lens fibers immediately adjacent to the posterior synechias (×240).

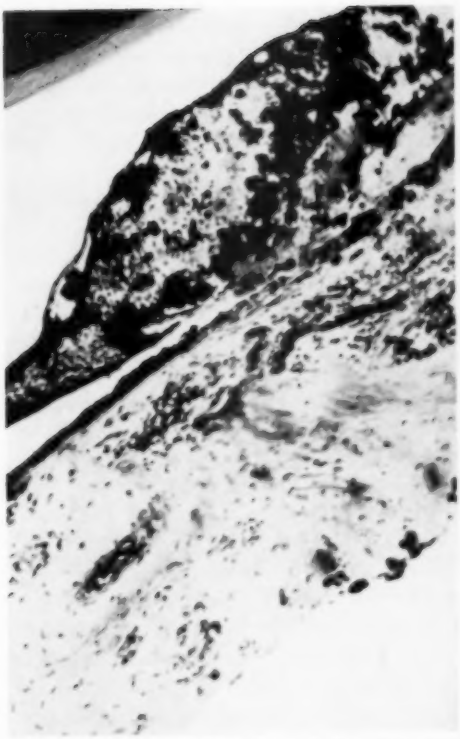


Fig. 6 (Baum). Adhesion between ciliary process and iris following radiation by ultrasonic energy, 3.0 W/cm.²/5 min. (×135).

Fig. 7 (Baum). Detailed view of the zone of adhesion between ciliary process and iris (×264).

Total cataracts were induced in two other rabbits, both of whom had been exposed to the maximum power output of the generator prior to the addition of the voltage regulating equipment. Since the incidence of spontaneous total cataract in the rabbit is rare, the cataracts probably resulted from ultrasonic radiation.

No displacement of the nuclear layers of the retina as reported by Donn[16] was observed. Nor was there other evidence of inflammation or injury in the posterior segment.

In view of the work reported by Fry, Lynn, and Putman[17–20] on the destructive effects of ultrasonic radiation on nervous tissue, special studies of the optic nerves and chiasms were indicated. Histologic sections of these structures from rabbits whose eyes had been exposed to ultrasonic radiation in the therapeutic dosage range were prepared. No destructive action could be demonstrated (figs. 8 and 9).

As pointed out earlier in this paper, the ocular changes observed in those animals exposed to less than 2.5 watts per square centimeter for a maximum of five minutes of ultrasonic radiation were reversible. Hence, one would not expect any discernible changes on pathologic section. These observations were borne out in a review of the slides.*

An analysis of the pathologic material obtained from these experiments demon-

* I wish to thank Dr. Benjamin S. Gordon for reviewing the eye sections and Dr. Abner Wolf for reviewing the optic-nerve sections.

Fig. 8 (Baum). Optic chiasm of a rabbit exposed to 12 doses of ultrasonic radiation at 0.5 W/cm.²/5 min. (Mahon stain, ×25).

strated that in an eye exposed as long as 10 minutes, permanent pathologic changes could not be produced, provided that the power output is kept below one watt per square centimeter of crystal.

Time/Power ratios

If the observations in Table 2 are plotted on a scattergram the pattern shown in Graph 1 evolves.

There is an inverse, linear relationship between the exposure time and the power employed. Thus, the greater the power, the shorter is the period of time necessary to produce damage. Because of the linearity of this relationship, it is postulated that this damage was caused by a heating effect. These experiments showed the upper limit of tolerance to ultrasonic radiation for the eye is 1 W/cm²/5 min. This dose was apparently painful and, therefore, general anesthesia was required. Evidently, the upper limit for clinical application by direct transmission would be about 0.5 W/cm.²/5 min., that is, the dose delivered to the tissues.

Discussion

On the basis of the experiments described in this paper, it is felt that this destructive action can be avoided by reducing the intensity of the ultrasonic radiation to safe levels.

Because the corneal, iris, and lenticular damage all lie along a straight line, it is postulated that the exposure to excessively high concentrations of ultrasonic energy, such as occurs in the central cone of ultrasonic energy from the transducer, can cause focal damage of the lens. Such injury results in focal lenticular opacification and does not progress to generalized cataract formation. Zeiss,[14] Kawamoto,[15a] and Lavine[15] experimentally produced such focal opacities in the lens. A study of the intensities of ultrasonic energy used by these workers confirms the hypothesis that excessive levels of ultrasonic energy may produce irreversible punctate lenticular opacities.

The phenomenon reported by Donn was due to the very high energy levels he employed as well as the further concentration of

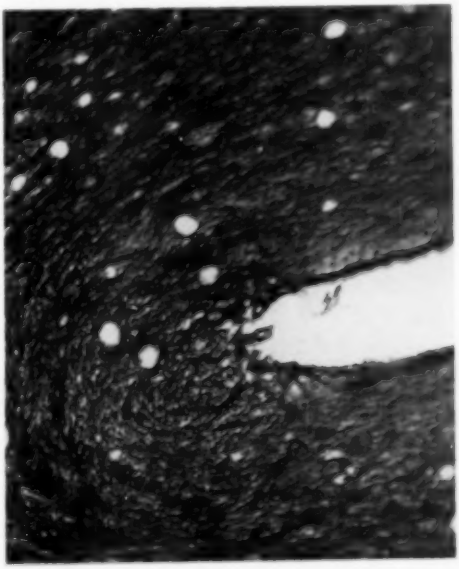
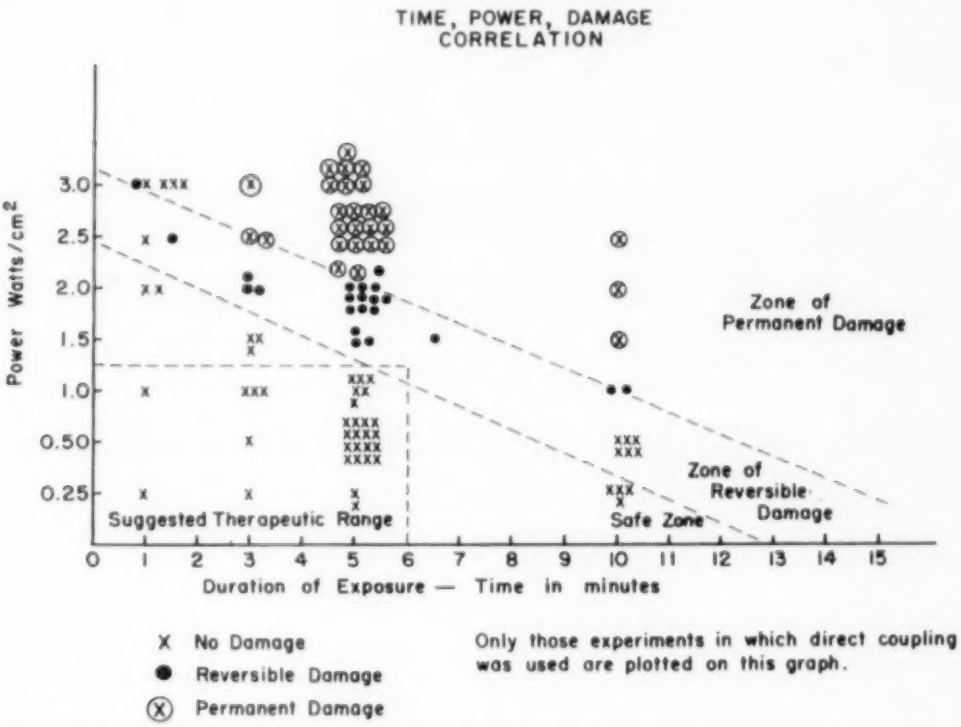


Fig. 9 (Baum). High-power view of segment of Figure 8.



Graph 1(Baum). Scattergram of eyes exposed to ultrasonic radiation by the direct coupling technique.

the ultrasonic energy by the use of focusing transducers. This concentrated the energy to immeasurably high levels. In the absence of these two factors no injury to the posterior segment ensues.

Summary

This report summarizes the effect of ultrasonic radiation on the rabbit eye and adnexa in vivo. Three definite patterns of reaction were observed.

1. Irreversible damage was produced by a range of 2.5-3.0 W/cm.²/5 min.—direct coupling.

2. Reversible effects were produced within the range of 1.5-2.0 W/cm.²/5 min.—direct coupling.

3. Safe range: 0.25 W/cm.²/5 min.—1.0 W/cm.²/3 min.—direct coupling.

These observations may be interpreted as demonstrating a linear relationship between time/power. Thus, the greater the intensity of the ultrasonic energy delivered to the eye, the shorter the period of time required for an effect (and vice versa).

All pathologic changes occurred in the anterior half of the globe. The possibility of cataract secondary to ultrasonic radiation must be borne in mind. No neurologic changes were produced by ultrasonic irradiation.

On the basis of these observations, it is felt that, if ultrasonic radiation were to be used therapeutically, the tissue dosage of one watt per square centimeter for five minutes would be the uppermost therapeutic level. The most feasible clinical method to couple ultrasonic radiation to an eye is to

employ a water-filled condom with an ointment coating applied to the closed lids. This will be elaborated upon in a paper to be reported elsewhere. Power output must always be kept below any pain or heat sensation.

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Ophthalmic Miniature

. . . And so after supper parted, and to bed, my eyes bad, but not worse, only weary with working. But, however, I very melancholy under the fear of my eyes being spoiled, and not to be recovered; for I am come that I am not able to read out a small letter, and yet my sight good for the little while I can read, as ever they were, I think.

Pepys' Diary, June 30, 1668.

VITREOUS HEMORRHAGES*

Associated with sickle cell-hemoglobin C disease

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In 1910, Herrick[1] described the first clinical case of sickle-cell anemia in man. It was not until 1937, however, that the first report of an ocular pathologic process appeared. Hardin[2] reported congenital abnormalities of retinal blood vessels, characterized by marked venous dilatations and tortuosity, in two Negro children with sickle-cell anemia. In 1952, Edington and Sarkies[3] reported two cases of sickle-cell anemia with retinal microaneurysms and a vitreous hemorrhage in one case. In 1953, Rudd, Evans, and Peeney[4] reported a case of thalassemia minor with retinal hemorrhages and exudates and vitreous hemorrhages. Mention was made of the fact, however, that the patient had definite latent sickling and that the case might represent a combination of the traits of sickling and thalassemia. In 1954, Henry and Chapman[5] reported the association of vitreous hemorrhage and retinopathy with sickle-cell disease and presented nine cases with ocular pathology.

Since the appearance of these papers many fundamental advances in our understanding of the basic hematologic concepts of sickle-cell disease have been brought forth, forming the background for this paper.

With the discovery by Pauling and his associates,[6] in 1949, that sickle-cell hemoglobin and normal hemoglobin had characteristically different electrophoretic patterns, the concept of sickle-cell disease was broadened. This finding introduced the concept of "molecular disease" wherein, due to abnormalities of protein synthesis, certain diseases are genetically determined. Subsequently, by means of hemoglobin electrophoresis, additional genetically determined abnormalities of hemoglobin were discovered[7,8] some of which, when coexisting with sickle-cell hemoglobin, gave rise to diseases previously mistaken for sickle-cell anemia or sickle-cell trait. This entire subject of human hemoglobin types has recently been reviewed by Chernoff.[9]

Table 1 shows the conventional representation of the genetic makeup of the cases of concern in this report. Many other disease variants have been discovered[9] but are not the subject of present concern.

Patients with sickle-cell anemia are found to be homozygous for abnormal sickle hemoglobin (hemoglobin S), whereas, patients with sickle-cell trait are found to be heterozygous, exhibiting a mixture of normal hemoglobin (hemoglobin A) and sickle hemoglobin (hemoglobin S). Patients with sickle cell-hemoglobin C disease are found to be heterozygous, resulting from the combination of two genetically determined abnormal hemoglobins—hemoglobin S and hemoglobin C.

In addition to these diseases arising from genetically determined abnormalities of hemoglobin, other conditions have been reported resulting from the combination of the abnormal sickle hemoglobin with genetically determined abnormalities of red cells, as thalassemia, producing sickle cell-thalassemia disease.

TABLE 1

Representation of genetic makeup of cases herein reported

Symbol	Disease
S-S	Sickle-cell anemia
S-A	Sickle-cell trait
S-C	Sickle cell-hemoglobin C disease
S-Thal	Sickle cell-thalassemia disease

* From the Wilmer Ophthalmological Institute of The Johns Hopkins Hospital. Presented at the Wilmer Residents Association Meeting, April 19, 1956.

The purpose of this paper is threefold: (1) To review the experience at The Johns Hopkins Hospital relative to vitreous hemorrhages and retinopathy associated with sickle-cell disease; (2) to report the ocular changes associated with sickle cell-hemoglobin C disease; (3) to mention the prophylactic treatment by surface diathermy of two cases of sickle cell-hemoglobin C disease with ocular vascular changes.

Review of cases between 1937 and 1952

In the 16-year period between 1937 and 1952, and including some cases obtained since that time, the records of 140 cases of sickle-cell disease at The Johns Hopkins Hospital were reviewed. The original diagnoses made during this period were sickle-cell anemia, sickle-cell trait, and atypical sickle-cell disease. On the basis of hemoglobin electrophoresis, 20 of these cases have since been placed in the category of sickle cell-hemoglobin C disease, while five of these cases have been classified as sickle cell-thalassemia disease. The remaining 115 cases still remain in the sickle-cell anemia and sickle-cell trait categories, but a great majority have yet to be re-evaluated with the aid of hemoglobin electrophoresis.

Fifty-three cases of sickle-cell anemia were found. Of these 25 cases (47 percent) were described as having dilated and tortuous veins. Of 62 cases of sickle-cell trait, only one case was described as having dilated and tortuous veins. None of the patients with sickle-cell anemia or sickle-cell trait have ever been described as having retinopathy or vitreous hemorrhages. Of the five cases of sickle cell-thalassemia disease, there are no reports of any abnormal ocular findings.

Records of 20 cases of sickle cell-hemoglobin C disease were reviewed. Of this group, 13 cases had never had any abnormal ocular findings described, but in seven cases vitreous hemorrhages and/or retinopathy were described. The ocular pathology of five cases seems to be unequivocally related to sickle cell-hemoglobin C disease.

In the other two cases, however, the role of the sickle cell-hemoglobin C disease, as an etiologic factor, cannot be established with certainty.

One patient had had severe trauma to one eye, tertiary syphilis, and hypertensive cardiovascular disease, and the ocular findings are probably unrelated to the sickle cell-hemoglobin C disease.

Another patient had had a long history of recurrent anterior and posterior uveitis, presumed to be on a tuberculous basis, with marked cutaneous hypersensitivity to old tuberculin. He developed bilateral retinitis proliferans and a retinal detachment in one eye which subsequently went into phthisis and required enucleation. Certainly the relationship of the sickle cell-hemoglobin C disease to the underlying process cannot be established.

Ocular manifestations

The striking ocular manifestation of our patients with sickle cell-hemoglobin C disease has been the high incidence of massive organizing vitreous hemorrhages. Of five patients with ocular involvement, which at this time seems unequivocally due to sickle-cell-hemoglobin C disease, four have vision in one eye of light perception only. On the basis of examination of their remaining eyes by means of direct and indirect ophthalmoscopy, the following changes have been observed.

The earliest vascular abnormality observed was the appearance of a neovascular-like, anastomotic network of fine vessels, apparently in relation to venules, in the peripheral temporal quadrant (fig. 1). Initially the findings appear to be localized to the peripheral temporal quadrants, but as the disease progresses changes are seen in other quadrants as well. The most important finding, and the presumed site of occurrence of ultimate hemorrhaging, is the appearance of twisted, corkscrewlike venules, arranged in a multiple arborizing fashion, with terminal dilatations appearing to extend into

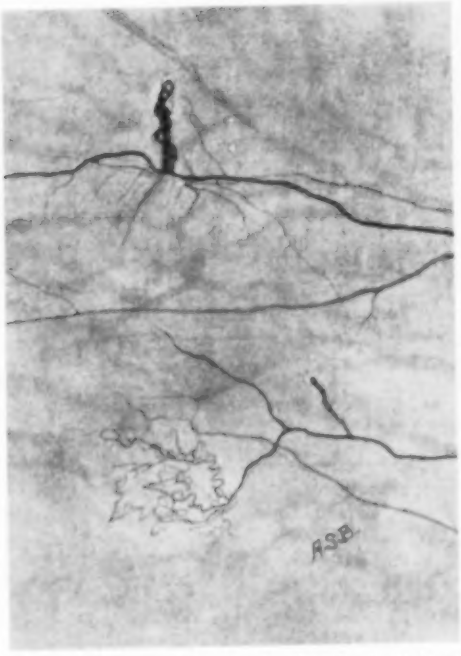

Fig. 1 (Hannon). *Case 2*, showing fundus lesions of the right eye.

the vitreous (fig. 2). Multiple occlusions of terminal venules and arterioles are also seen. One patient showed salmon-pink to whitish exudative plaques in the peripheral retinal quadrants in association with involved vessels (fig. 2).

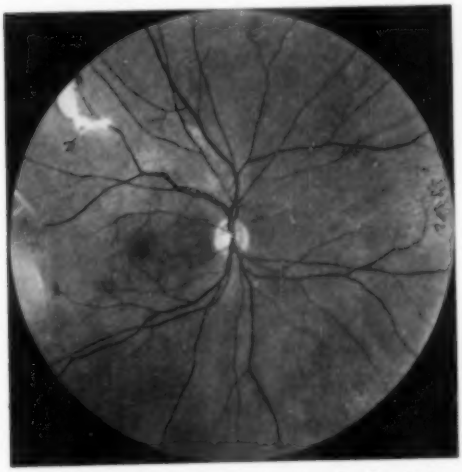

Fig. 2 (Hannon). *Case 3*, showing fundus lesions of the right eye.

In addition to the unusual eye findings of sickle cell-hemoglobin C disease, there are other salient features somewhat peculiar to this disease which may be present. Anemia of appreciable degree may be found in infrequent episodes. Transient hemolytic episodes may occur, during which profound anemia can develop. Such hemolytic crises are frequently seen in women during the last trimester of pregnancy or in the immediate postpartum period. Target cells appear in great frequency in blood smears of these patients, averaging about 60 percent. Splenomegaly persisting into adult life is another unusual feature. Aseptic necrosis of the humeral or femoral head is frequently seen. They are also prone to develop episodes of pneumonitis and lesions suggestive of pulmonary infarcts. Finally, renal hematuria occurs with great frequency in these patients. An excellent review of the clinical features of the genetic variants of sickle-cell disease has been reported by Smith and Conley.[10]

Treatment

In three of our patients who had organized massive vitreous hemorrhages with vision of light perception only, and changes as previously described in the remaining eye, the prognosis for the remaining "good" eye seemed grave if left unattended. Of the various methods previously advocated for the treatment of Eales' disease, the one which seemed most logical, and which would probably prove most efficacious in these particular cases, was the application of surface diathermy to the involved peripheral retina in hope of obliterating the involved vessels presumed to be sites of eventual hemorrhaging.

Weve[11] was the first to use surface diathermy in a somewhat similar situation when he advocated its use in the treatment of retinal angiomatosis associated with von Hippel's disease. Verhoeff[12] originally described the use of surface diathermy in the

treatment of Eales' disease associated with tuberculous periphlebitis. Recently, Pajtas[13] and Franceschetti and Forni[14] have also advocated the use of surface diathermy in this condition.

Accordingly, two of our patients consented to prophylactic surgery. One patient (case 1) has had a completely uneventful course following operation over two-and-one-half years ago, has maintained 20/20 vision, and no new lesions have appeared. The other patient (case 2) was recently operated on quite uneventfully and cannot be properly evaluated at this time. A third patient (case 3) has recently been advised to have prophylactic surgery.

While no conclusions can be drawn on the basis of these two cases, it appears that surface diathermy may prove to be a sight-saving procedure in these patients and further evaluation is to be carried out.

Case reports

Patients considered for prophylactic surface diathermy

Case 1

H. C. (JHH #628312), a 38-year-old Negro, was perfectly well until 15 years of age when he noted the onset of hematuria. During the next six-year period he had many episodes of recurrent hematuria, established to be of left kidney origin, requiring three periods of hospitalization elsewhere. In 1944, because of recurrent hematuria, a left nephrectomy was performed.

In January, 1953, he was admitted to The Johns Hopkins Hospital because of the occurrence of three generalized convulsive seizures in the preceding six-month period. At that time, on the basis of hemoglobin electrophoresis, the diagnosis of sickle cell-hemoglobin C disease was established. The convulsions were thought to be due to vascular occlusions in the cerebral cortex secondary to the sickling disease.

During this period of hospitalization an eye consultation was obtained. At that time vision in the right eye was 20/30 and vision in the left eye was 20/30. Ophthalmoscopic examination of the right eye revealed many vitreous hemorrhages and, in the peripheral temporal quadrant, areas which appeared to be small red hemorrhages or dilated tips of vessels were seen. The left eye was reported as being normal.

In June, 1953, he was again seen and had vision of hand movements at one foot in the right eye and the vision in the left eye was 20/20.

Examination of the right eye revealed a massive organizing vitreous hemorrhage. In the left eye, ophthalmoscopic examination revealed in the temporal periphery, at the 3-o'clock position, several fine areas of small blood vessels and white plaques anteriorly which seemed related to many occluded fine blood vessels. At the 2:30-o'clock position and at the 4-o'clock position tiny fan-shaped tufts of five or six vessels, ending in aneurysmal-like dilatations, were seen. These lesions were felt to have exactly the same appearance as those seen six months previously in the right eye. Accordingly, the prognosis seemed poor for the left eye of this patient who exhibited peculiar bleeding tendencies associated with sickle cell-hemoglobin C disease, and operation was advised as a prophylactic measure.

In July, 1953, surface diathermy was placed to the left eye. The postoperative and subsequent course has been quite uneventful.

When last seen in April, 1956, the patient had light perception in the right eye and the vision in the left eye was 20/20. No new lesions were seen and the previous ones were completely obliterated by the diathermy reaction.

Case 2

C. K. (JHH #703545), an 18-year-old Negro, was first admitted to the Wilmer Institute in May, 1955, for a diagnostic survey because of massive vitreous hemorrhages in the left eye one month prior to admission.

His past history revealed that about the age of 10 to 11 years, he began having bouts of severe bone pain in both upper and lower extremities. These attacks usually lasted from two to three weeks, during which period he was intermittently confined to bed. Seven months prior to admission he was hospitalized elsewhere following an episode of fever, chills, unilateral chest pain, and generalized pains, with a tentative diagnosis of right-sided pneumonitis. Chest X-ray films revealed a right lower lobe density only and he responded favorably to streptomycin, terramycin, and penicillin. (In retrospect, this episode might have represented a pulmonary infarction commonly seen in patients with sickle cell-hemoglobin C disease.)

In April, 1955, he noted the sudden onset of floaters before the left eye and within one week had vision in the left eye of light perception only. On admission he was found to have vision in the right eye of 20/20 and in the left eye of light perception only. Examination of the left eye revealed a massive vitreous hemorrhage. Ophthalmoscopic examination of the right eye revealed a neovascularlike anastomotic network of fine vessels in the peripheral temporal quadrant. The impression on admission was Eales' disease of undetermined etiology.

Subsequently hemoglobin electrophoresis established the diagnosis of sickle cell-hemoglobin C disease and the entire hematologic survey was characteristic for this condition. Moderate cutane-

ous sensitivity to old tuberculin was demonstrated but the chest X-ray films were normal and three gastric washings for acid-fast bacilli were negative on culture and guinea pig examination. The impression on discharge was Eales' disease secondary to sickle cell-hemoglobin C disease. Nonetheless, a three-month course of dystricin and paramino salicylic acid was given without any subsequent change.

In the course of the next nine months the lesions in the right eye (fig. 1) appeared to be increasing in size and extent and accordingly prophylactic surgery was advised. In March, 1956, surface diathermy was applied to the right eye. The postoperative and subsequent course has been completely uneventful and the patient has maintained 20/20 vision in the eye. The diathermized area shows chorioretinal scarring and obliteration of many vessels in the involved area. Further evaluation cannot be ascertained at this time.

Case 3

T. H. (JHH #696215), a 27-year-old Negro, was first seen in the Wilmer out-patient department in March, 1955, with a history of having suddenly lost vision in the left eye following a blow with a wrench. This cleared completely in three days and he was able to read 20/20. About seven to 10 days later, however, he suddenly lost vision in the left eye again. He was originally seen in another eye hospital and told he had Eales' disease.

When first seen at the Wilmer Institute in March, 1955, vision in the right eye was 20/15 and vision in the left eye was light perception. Examination of the left eye revealed a massive vitreous hemorrhage. Ophthalmoscopic examination of the right eye revealed many silver wire arterioles and one fresh retinal hemorrhage. The impression was Eales' disease of undetermined etiology.

In the course of a routine survey the patient was found to have sickle cell-hemoglobin C disease with an associated thrombocytopenia, and the Eales' disease was subsequently felt to be secondary to this.

During the course of the next year the fundus picture of the right eye changed considerably (fig. 2). When last seen in March, 1956, he had many areas of twisted, corkscrew-like venules with terminal dilatations and some fresh retinal hemorrhages were seen. Many occlusions of venules and arterioles were seen, and a salmon-pink exudative plaque was seen in the far temporal periphery. Because of the marked and advanced changes, this patient was advised to have surface diathermy to the right eye as a prophylactic measure.

Summary and Conclusions

1. The concept of sickle-cell disease has been broadened with the aid of hemoglobin electrophoresis and many genetic variants are now recognized as distinct clinical entities.

2. All the previous reports of ocular pathologic processes associated with sickle-cell disease were presented prior to knowledge that these variants existed and there is no correlation between the clinical picture and the exact hematologic diagnosis.

3. A review of the experiences at The Johns Hopkins Hospital with ocular changes associated with sickle-cell disease seems to indicate that the peculiar retinopathy and vitreous hemorrhage occurs almost always in the sickle cell-hemoglobin C variety. One case in the literature was reported which apparently was secondary to sickle cell-thalassemia disease. Further evaluation of the cases previously reported, by hemoglobin electrophoresis, is necessary to determine the incidence, if any, in patients with sickle-cell anemia and sickle-cell trait.

4. The ocular findings of sickle cell-hemoglobin C disease are described and two cases treated prophylactically by surface diathermy are presented.

5. While no conclusions may be reached at this time, in view of the excellent results obtained thus far in these two patients, it appears justifiable to pursue continued evaluation of prophylactic surface diathermy in these patients.

The Johns Hopkins Hospital (5).

I wish to thank Mrs. Annette Burgess of The Wilmer Institute for the fundus drawings.

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RETROSPECTIVE DIAGNOSIS*

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Even if diagnosis in retrospect were merely an academic exercise, there would still be a place for it amidst the bustle of modern life. Retrospective diagnosis can make, and has already made, rich contributions to history—a subject which it is no longer fashionable to dismiss with Henry Ford's laconic monosyllable, bunk. But I do believe, and I shall try to convince my colleagues, that retrospective diagnosis may be commended not only as an agreeable pastime but also for its utility. That is to say, we can all stimulate our clinical wits and avoid at least some sins of omission if we listen to the teaching which diagnosis in retrospect will provide.

There are still too many people who maintain that treatment is the only thing that really matters in medicine. Carried to its logical conclusion, this attitude would reduce the art of healing to chaos. All the elaborate manipulations of the cranio-surgeon, backed by up-to-date technique in general anesthesia, will be wasted unless patients can be properly selected by diagnosis. Many a serious organic defect will pass unrecognized until it is no longer remediable if relief of immediate symptoms be the sole concern of a family doctor. Without diagnosis there can be no successful treatment apart from stray crumbs of empiricism; nor shall we be able to make wise decisions about the patient's future activities. Diagnostic skill linked with common sense points the way to prognosis and correct treatment, although naturally the *application* of a particular treatment must often remain in a few specialized hands.

Under the stress of their final medical examinations, students are apt to lie awake in the small hours, when, as Galsworthy aptly said, the chrysalis of misgiving so readily turns into the butterfly of panic; and so they often make pessimistic retrospective diagnoses based on their fear of having missed something. Even experienced ophthalmologists have lost sleep from self-reproach about imaginary cases of missed glaucoma and retinal detachment. Indeed such fears can become so obsessive that the

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victim will subject all his patients to a series of meticulous investigations, such as would normally be reserved for those exhibiting definite clinical abnormality.

One interesting kind of diagnosis in retrospect is the sudden revelation which may come like a flash when one is recounting to colleagues the features on an undiagnosed case of disease. That is to say, the very exercise of describing what are the salient features of a pathologic state may serve to indicate the correct diagnosis. Many of us must have known that consoling experience, although the consolation is often tempered by a desire to kick oneself for not having originally interpreted the puzzle. At any rate the lesson is clear. However strange a diseased state may appear, we should forge ahead and marshal whatever facts may bear upon the problem; and when once the symptoms and signs are assembled, description may suddenly gather them into a convincing pattern.

Medical students are notoriously liable to *les maladies imaginaires*, so that many a healthy man has written himself off as the victim of tuberculosis and other terrible diseases. But the opposite attitude is perhaps equally prevalent in our profession. One of my fellow-students at St. Thomas's told me how, in retrospect, his own attack of appendicitis produced symptoms exactly imitating the classical version of that malady; and yet at the time it had never occurred to him that he was suffering from anything more than a bilious upset. As soon as the surgeon showed him the offending organ, which would clearly have perforated if it had been left inside for another hour or two, he laughed almost enough to burst his stitches.

Ten years ago I was describing to a physician some niggling rhythmical pains in the small of my back. I told him that these pains had been intermittently present for almost a week, and that they were quite unlike anything I had known in the past. Then, as an afterthought, I added: "Oh yes, and, funnily enough, I think I must have been bitten by a harvest-bug yesterday in just about the same place." "How interesting!" he said, smiling, and then, as the truth suddenly dawned on me, I exclaimed: "What a fool I am! Of *course* I've got the shingles."

Most clinicians can remember instances of narrow escapes from a blunder. In the early days of my training, I examined a middle-aged woman complaining of soreness in one eye for the last two days. Having discovered that a small, irregular area of the corneal surface lacked epithelium I asked her whether any foreign matter had got into the eye, and she said she thought a speck of dust had blown in two days previously. Search for a foreign body drew a blank. I then instilled a drop of parolein, and told her that she need not return to the hospital unless any discomfort should persist after 24 hours. Just as I was about to let her go, I had a notion that she was making light of her pain. All at once she seemed anxious and drawn. I asked her to sit down while I palpated both eyes in succession. Instantly it became obvious that she was suffering from subacute glaucoma, and that the supposed corneal abrasion had arisen from rupture of epithelial vesicles. Retrospective diagnosis in this particular example occurred after the lapse of only a few seconds, and soon enough to prevent a disaster, but it acted as a salutary shock, a warning not to leap to hasty conclusions.

Before we proceed to consider a few instances of ocular diagnosis in retrospect, it will perhaps be worth while to recall how deeply our interpretation of historic events and personages must have been modified by recent advances in medical knowledge. Let us apply retrospective diagnosis to some bygone epidemics, to certain people famous in history or in literature, and to a few characters in fiction.

Epidemics in former ages

The late Sir Arthur Shipley, Master of Christ's College, Cambridge, once remarked

that insects contend with man for the mastery of the world. Without enumerating a long list of diseases, we can prove the force of Shipley's judgement. Within the last 60 years insects have been shown to convey four terrible scourges which in their time have wiped out millions of people—plague, malaria, yellow fever, and typhus. Indeed it was suggested not long ago that typhus and plague, together with a few other devastating maladies, have decided more campaigns than Hannibal, Caesar, Napoleon, and all the generals in history. The story that tells how yellow fever was stamped out in the Panama Canal Zone will remain forever not only as a monument of human endeavor, but also as a lesson in retrospective diagnosis. Similarly we are enabled by the achievements of Ross and other pioneers in the campaign against malaria to obtain some inkling of the havoc which must have ensued when that disease was first let loose in Italy by Hannibal's army.

Many people alive today can remember the outbreak of plague which, starting at Hong Kong in 1896, spread to Japan, India, and Egypt, and by 1899 had extended to the Philippines and South America. Boccaccio's description of the Florentine plague in the *Decameron* is known all over the world, and the English outbreak of 1665, which killed nearly 70,000 people in London alone, has been recorded by Defoe, unsurpassed as a writer of vivid prose narrative and author of *Robinson Crusoe*. Three centuries earlier the Black Death, another outbreak of plague, had halved the population of England, but there must have been other epidemics not specifically recorded.

Most authorities believe that the epidemic described by Galen at the time of Marcus Aurelius was smallpox, and that the first certain outbreak of plague was in the sixth century A.D. during the reign of Justinian. Gibbon tells how the typical victim "despaired as soon as he had heard the menace and felt the strike of an invisible sceptre." He goes on to describe how "ten thousand persons died each day at Constantinople, many cities of the East were left vacant, and in several districts of Italy the harvest and vintage withered on the ground."

One is irresistibly reminded of the 1879 Volga epidemic, when some of the affected regions suffered a 90-percent mortality, and whole villages were wiped out.

In the seventh century, A.D., the Venerable Bede told of his Jarrow monks being decimated by plague, and London was said to have been entirely deserted. In this connection it may be of interest to recall that St. Paul's Cathedral, which was of course preceded by other churches upon the same site, is built upon Watling Street. Watling Street was one of the main Roman thoroughfares through London, and it seems difficult to account for its interruption without assuming that London was not continuously peopled during those dark centuries which intervened between the departure of the Romans and the Norman invasion. Plague is the most likely explanation for this temporary abandonment of London.

Regular sanitary measures against the plague in England were first taken in 1543 when Henry VIII ordained that all houses harboring plague-victims must be marked with a cross, and inscribed: "Lord have mercy on us!"—a prayer which will always be remembered as the refrain of Thomas Nashe's haunting "Lines in Time of Pestilence."

> Adieu, farewell earth's bliss!
> This world uncertain is:
> Fond are life's lustful joys,
> Death proves them all but toys.
> None from his darts can fly;
> I am sick, I must die—
> *Lord, have mercy on us!*
>
> Rich men, trust not in wealth,
> Gold cannot buy you health;
> Physic himself must fade;
> All things to end are made;
> The plague full swift goes by;
> I am sick, I must die—
> *Lord, have mercy on us!*
>
> Beauty is but a flower
> Which wrinkles will devour;

Brightness falls from the air;
Queens have died young and fair;
Dust hath closed Helen's eye;
I am sick, I must die—
Lord, have mercy on us!

Strength stoops unto the grave,
Worms feed on Hector brave;
Swords may not fight with fate;
Earth still holds ope her gate;
Come, come! the bells do cry;
I am sick, I must die—
Lord, have mercy on us!

Wit with his wantonness
Tasteth death's bitterness;
Hell's executioner
Hath no ears for to hear
What vain art can reply;
I am sick, I must die—
Lord, have mercy on us!

Haste therefore each degree
To welcome destiny;
Heaven is our heritage,
Earth but a player's stage.
Mount we unto the sky;
I am sick, I must die—
Lord, have mercy on us!

The most lucid account of an epidemic in ancient literature was written by Thucydides. In the winter of 431—30 B.C., when Athens was at the height of her power, Pericles delivered his famous funeral speech in commemoration of Athenians fallen in battle during the early stages of the Peloponnesian War. Early in the following summer Archidamus in command of the Peloponnesians and their allies invaded Attica, and proceeded to ravage the countryside. All the rural inhabitants took refuge in Athens, which could never be cut off from its Black Sea corn supplies so long as the road between the long double walls remained as a link between the harbor of Piraeus and the main city. There was, however, an acute housing shortage, and sanitation broke down under the overcrowding. This is how Thucydides describes the resulting outbreak, which rapidly spread from the Piraeus to Athens itself:

"Such was the order of the funeral celebrated in this winter, with the end of which ended the first year of the Peloponnesian War. As soon as summer returned, the Peloponnesian army, comprising as before two-thirds of the force of each confederate state, under the command of the Lacedaemonian king Archidamus, the son of Zeuxidamus, invaded Attica, where they established themselves and ravaged the country. They had not been there many days when the plague broke out at Athens for the first time. A similar disorder is said to have previously smitten many places, particularly Lemnos, but there is no record of such a pestilence occurring elsewhere, or of so great a destruction of human life. For a while physicians, in ignorance of the nature of the disease, sought to apply remedies; but it was in vain, and they themselves were among the first victims, because they oftenest came into contact with it. No human art was of any avail, and as to supplications in temples, enquiries of oracles, and the like, they were utterly useless, and at last men were overpowered by the calamity and gave them all up.

"The disease is said to have begun south of Egypt in Aethiopia; thence it descended into Egypt and Libya, and after spreading over the greater part of the Persian empire, suddenly fell upon Athens. It first attacked the inhabitants of the Piraeus, and it was supposed that the Peloponnesians had poisoned the cisterns, no conduits having as yet been made there. It afterwards reached the upper city, and then the mortality became far greater. As to its probable origin or the causes which might or could have produced such a disturbance of nature, every man, whether a physician or not, will give his own opinion. But I shall describe its actual course, and the symptoms by which any one who knows them beforehand may recognize the disorder should it ever reappear. For I was myself attacked, and witnessed the sufferings of others.

"The season was admitted to have been remarkably free from ordinary sickness; and if anybody was already ill of any other disease, it was absorbed in this. Many who were in perfect health, all in a moment, and

without any apparent reason, were seized with violent heats in the head and with redness and inflammation of the eyes. Internally the throat and tongue were quickly suffused with blood, and the breath became unnatural and fetid. There followed sneezing and hoarseness; in a short time the disorder, accompanied by a violent cough, reached the chest; then fastening lower down, it would move the stomach and bring on all the vomits of bile to which physicians have ever given names; and they were very distressing. An ineffectual retching producing violent convulsions attacked most of the sufferers; some as soon as the previous symptoms had abated, others not until long afterwards. The body externally was not so very hot to the touch, nor yet pale; it was of a livid colour inclining to red, and breaking out in pustules and ulcers. But the internal fever was intense; the sufferers could not bear to have on them even the finest linen garment; they insisted on being naked, and there was nothing which they longed for more eagerly than to throw themselves into cold water. And many of those who had no one to look after them actually plunged into the cisterns, for they were tormented by unceasing thirst, which was not in the least assuaged whether they drank little or much. They could not sleep; a restlessness which was intolerable never left them. While the disease was at its height the body, instead of wasting away, held out amid these sufferings in a marvellous manner, and either they died on the seventh or ninth day, not of weakness, for their strength was not exhausted, but of internal fever, which was the end of most; or, if they survived, then the disease descended into the bowels and there produced violent ulceration; severe diarrhoea at the same time set in, and at a later stage caused exhaustion, which finally with few exceptions carried them off. For the disorder which had originally settled in the head passed gradually through the whole body, and, if a person got over the worst, would often seize the extremities and leave its mark, attacking the privy parts and the fingers and the toes; and some escaped with the loss of these, some with the loss of their eyes. Some again had no sooner recovered than they were seized with a forgetfulness of all things and knew neither themselves nor their friends.

"The general character of the malady no words can describe and the fury with which it fastened upon each sufferer was too much for human nature to endure. There was one circumstance in particular which distinguished it from ordinary diseases. The birds and animals which feed on human flesh, although so many bodies were lying unburied, either never came near them or died if they touched them. This was proved by a remarkable disappearance of the birds of prey, which were not to be seen either about the bodies or anywhere else; while in the case of the dogs the result was even more obvious, because they live with man.

"Such was the general nature of the disease; I omit many strange peculiarities which characterized individual cases. None of the ordinary sicknesses attacked any one while it lasted, or, if they did, they ended in the plague. Some of the sufferers died from want of care, others equally who were receiving the greatest attention. No single remedy could be deemed a specific; for that which did good to one did harm to another. No constitution was of itself strong enough to resist or weak enough to escape the attacks; the disease carried off all alike and defied every mode of treatment. Most appalling was the despondency which seized upon any one who felt himself sickening; for he instantly abandoned his mind to despair and, instead of holding out, absolutely threw away his chance of life. Appalling too was the rapidity with which men caught the infection; dying like sheep if they attended on one another; and this was the principal cause of mortality. When they were afraid to visit one another, the sufferers died in their solitude, so that many houses were empty because there had been no one left to

take care of the sick; or if they ventured they perished, especially those who aspired to heroism. For they went to see their friends without thought of themselves and were ashamed to leave them at a time when the very relations of the dying were at last growing weary and ceased even to make lamentations, overwhelmed by the vastness of the calamity. But whatever instances there may have been of such devotion, more often the sick and the dying were tended by the pitying care of those who had recovered, because they knew the course of the disease and were themselves free from apprehension. For no one was ever attacked a second time, or not with a fatal result. All men congratulated them, and they themselves, in the excess of their joy at the moment, had an innocent fancy that they could not die of any other sickness.

"The crowding of the people out of the country into the city aggravated the misery; and the newly-arrived suffered most. For, having no houses of their own, but inhabiting in the height of summer stifling huts, the mortality among them was dreadful, and they perished in wild disorder. The dead lay as they had died, one upon another, while others hardly alive wallowed in the streets and crawled about every fountain craving for water. The temples in which they lodged were full of the corpses of those who died in them; for the violence of the calamity was such that men, not knowing where to turn, grew reckless of all law, human and divine. The customs which had hitherto been observed at funerals were universally violated, and they buried their dead each one as best he could. Many, having no proper appliances, because the deaths in their household had been so numerous already, lost all shame in the burial of the dead. When one man had raised a funeral pile, others would come, and throwing on their dead first, set fire to it; or when some other corpse was already burning, before they could be stopped, would throw their own dead upon it and depart."

Grote the historian looked upon Thucydides' plague as an eruptive typhoid. Langdon-Brown (1938) was inclined to call it scarlatina maligna, and several other theories have been evolved, but it would appear that typhus tallies most closely with Thucydides' description. It is particularly interesting to note how he mentions loss of fingers and toes as a possible sequel, because we know that gangrene of the extremities was frequently observed to follow typhus in the 1915 Balkan visitation.

Historical figures

From the age of 27 years, onward, Martin Luther suffered from sensations of banging, thumping, whistling, and other strange head noises. Soon these attacks became linked with giddiness. He was wont to ascribe his symptoms to the activities of a personal devil, and indeed he once went so far as to hurl an inkpot at this imaginary spirit. Later deafness supervened, and it seems clear that Luther was a victim of Menière's disease. Swift the great satirist probably suffered from the same complaint. James I was one of England's most unfortunate kings. His teeth were bad, and he was racked by arthritis. A post-mortem examination revealed stones in his left kidney, and cardiac enlargement. No wonder he was constantly preoccupied with his health, so that, in the words of Maclaurin (1930), "he used faithfully to insist on being bled every day, until his least dignified ailment saved the doctors the trouble."

Alexander the Great, Julius Caesar, St. Paul, Mahommed, and Napoleon have all been retrospectively diagnosed as epileptics, though the evidence is not conclusive in each one of them. Napoleon is said also to have displayed pituitary insufficiency. Hannibal lost an eye after he had crossed the Apennines into the valley of the lower Arno in 217 B.C., the year before his greatest victory at Cannae. At this distance of time no confident diagnosis can be made, but it is easy to imagine his being afflicted with severe

corneal ulceration after the fatigue and exposure of his Alpine passage a few months previously. Nor do we know what exactly was the lesion that destroyed Nelson's right eye, but he probably sustained a perforating wound in 1794, when a shot from Calvi in Corsica struck the battery beside him, and drove sand and gravel into his face. Most people remember the story of how Nelson deliberately placed the telescope in front of his blind eye at Copenhagen a few years later, as a token of his intension to ignore that signal of recall which would otherwise have prevented him from gaining a victory. I have ventured to coin the phrase "facultative Nelsonism" to describe a state of mind which enables a surgeon to forget his failures and register 100 percent success in a long series of operations.

Nero, the Roman emperor, is said to have suffered from weak eyes, and evidently he used some form of cut emerald as an aid to vision when he watched gladiatorial contests at the Colosseum. We cannot make any precise conjecture about Nero's ocular state, and perhaps it is in the realm of psychopathology that the emperors of ancient Rome offer such scope for retrospective diagnosis. They were like that little girl who always exhibited extremes of behaviour . . .

"When she was good, she was very very good,
But when she was bad, she was *horrid*."

Certainly there were no *medium* Roman emperors. On the one hand we have a collection of splendid fellows like Hadrian and the Antonines; but the reverse of the medal shows unashamed gangsters or criminal lunatics. Would Caligula be allowed to remain at large today—Caligula, who made his horse a consul, and solemnly ordained his own apotheosis? Perhaps his nature was transformed by encephalitis. After all, his father Germanicus was one of the noblest of the Romans, and Caligula himself at the beginning of his reign behaved justly and beneficently. In less than a year, however, a serious illness transformed him into a bloodthirsty buffoon.

Literary people

Although one can assemble a few instances of authors who led quiet, blissful lives, it must be admitted that the creative faculty more often than not exacts penalties. If a writer produces work of genius in spite of some grievous handicap of body, it might seem reasonable to suppose that, without his thorn in the flesh, he would have achieved something even greater. Such an assumption would not always be justified. On the contrary, we have strong grounds for believing that certain kinds of mental and physical frailty can act as a spur.

Would Keats have been as good a poet if he had not acquired tuberculosis; and would he have stood a better chance of recovery if he had not been consumed by the fire of genius? We shall never know for certain, nor can we deny that the work of Coleridge, de Quincey, Shelley, and Edgar Allen Poe may have owed something to their immense capacity for laudanum. De Maupassant was probably the best short-story writer of the 19th century, but he was afflicted with syphilis and cursed with a craving for liquor. Balzac wrote some of his best work under the shadow of hyperpiesis, and probably Byron's satire was pointed by the stigma of his club-foot. Kyphosis lay behind many of Pope's inspired outpourings of venom, and rheumatic disease failed to quench Robert Burns' lyric notes.

Walter Scott has been singled out for mention as an unusually healthy author, except for his lame leg and his terminal arteriosclerosis. But was he? When he was 14 years old he had a serious bowel hemorrhage of unexplained origin. Treatment consisted of bleeding, blistering, exposure to cold, and an exclusively vegetable diet. He was rigidly forbidden to speak, and yet he managed to solace the days of recovery by rigging up a series of mirrors which enabled him to watch the soldiers marching by. Later he suffered two years of intermittent hell from cholecystitis, the onset of which he vividly described as "cramp setting fire to

its lodging." Again he was bled and blistered, but his spirit remained indomitable, so that, after a night of agony, he would rise early and ride 20 miles on horseback. Furthermore, he managed at this period to write some of his best work, including much of *Ivanhoe* and *Rob Roy*. Incidentally he suffered from dermatitis, renal colic, and the "black dog" of depression, for which he coined the title "morbus eruditorum." All these afflictions beset him before the ruin of his publishers in 1826—an event which plunged him into a crushing schedule of work undertaken with a view to paying-off the debt.

The rewriting of biography in terms of pathology can of course be overdone, especially when the neuropsychiatrists set to work. A few years ago a book came out depicting Anthony Trollope as a strange, warped figure. Gone was the ardent rider to hounds, the genial whist-player at the Garrick Club, and in his stead was a bundle of Viennese complexes. Nevertheless it remains true that the lives of most authors are rich in psychopathologic material. Tolstoy and Carlyle are two obvious examples.

One of the best known lesions of literary men is Gibbon's hydrocele. This great historian was only 24 years of age when he consulted Caesar Hawkins, who hesitated whether to call the swelling a hydrocele or a hernia. In the light of what afterward happened, it was probably both. Thirty-two years later, in 1793, Cline, the well-known inventor of the splint, drew off a gallon of fluid, which reduced the "considerable protuberance" (Gibbon's own expression) by half. The remnant was a soft irregular mass which probably consisted of omentum within a hernial sac. A fortnight later Cline tapped another three-quarters of a gallon, but still the mass filled up, so that not long afterward a gallon-and-a-half was drawn off. These tappings together yield the equivalent of 52 tumblersfull, one for every week of a year, and yet Gibbon had fondly supposed, in those days of tight breeches, that his friends might not be aware of the infirmity. By the time of the third tapping the hydrocele had become inflamed and ulcerated, and peritonitis was the most likely immediate cause of Gibbon's death three days later.

Samuel Pepys' failing vision cut short the writing of his *Diary* when he was only 36 years old, and numerous theories have been advanced in explanation. Beattie (1953), however, points out that Pepys saw well enough to write his *Tangier Journal* much later, when he had reached the age of 50. Indeed he was able to go on studying documents until he died aged 70 years, but of course he used convex spectacles. It appears that Turlington, the spectacle maker whom Pepys had consulted in his earlier years, looked upon "old spectacles" as dangerous for people below the presbyopic age. Presumably Pepys was a hypermetrope, and Beattie believes that he suffered from associated hyperphoria.

Benvenuto Cellini, whose life was crowded with exciting events and hard work, tells us how he sustained an eye injury which miraculously responded to heroic measures:

"Now one morning I was sharpening some chisels before beginning my work, when the finest splinter of steel flew into my right eye, entering the pupil so far that it could not be taken out by any means. I thought for certain I should lose the sight of that eye. At the end of several days I called in Maestro Raffaello de' Pilli, the surgeon. He brought with him two live pigeons. Then laying me down on my back on a table, with a knife he cut open a great vein in the birds' wings, so that the blood spurted out into my eye. This eased me at once; by two days the splinter was out, and I was at rest, with my eyesight better than before. The feast of St. Lucy coming on in three days, I made a golden eye out of a French crown; and had it offered at the saint's shrine by one of my six nieces, the daughters of my sister Liperata. She was about 10 years old; and I

went with her to church to thank God and St. Lucy. For some time I gave up working on the Narcissus, but I got on with my Perseus, though under the difficulties I have already spoken of; for I had a mind to finish it, and then to be off."

Here again it is impossible to offer a precise diagnosis. Had the splinter really pierced the outer coat of the globe, or was it merely thrust between the corneal lamellae? If the latter explanation is correct, perhaps discharge of the splinter was achieved by exfoliation of the anterior layers, but why should Cellini's eyesight be better than it had been before the accident? One possible theory is that his sight had not actually improved, and that the apparent increase in visual acuity was a measure of the craftsman's relief at so narrowly escaping a disaster.

Another famous Italian who suffered from eye trouble was Dante, but no details are available about the cause of his defective vision. Concerning Milton, on the other hand, we have several important items of information, including his own words in prose and verse. The nature of Milton's blindness was discussed at length by Sorsby. Among the various explanations that have been put forward, glaucoma has been prominently mentioned by a number of writers, but there are serious objections to this theory. It will be recalled that Milton slowly and painlessly went blind between the ages of 36 years (or possibly a little earlier) and 44 years; but the important thing to note is that loss of the temporal field of one eye was an early symptom. Here is Milton's own version, contained in a letter written to his Greek friend Philaras in 1654, two or three years before the blindness became absolute:

"It is ten years, I think, more or less since I felt my sight getting weak and dull, and at the same time my viscera generally out of sorts. In the morning if I began as usual, to read anything, I felt my eyes at once thoroughly pained, and shrinking from the act of reading, but refreshed after moderate bodily exercise. If I looked at a lit candle, a kind of iris seemed to snatch it from me. Not very long after, a darkness coming over the left part of my left eye (for that eye became clouded some years before the other) removed from my vision all objects situated on that side. Objects in front also, if I chanced to close the right eye, seemed smaller. The other eye also failing perceptibly and gradually through a period of three years, I observed some months before my sight was wholly gone, that objects I looked at without myself moving, seemed all to swim, now to the right, now to the left. Inveterate mists now seem to have settled in my forehead and temples, which weigh me down and depress me with a kind of sleepy heaviness, especially from meal-time to evening. . . . But I should not forget to mention that, while yet a little sight remained when first I lay down in bed, and turned myself to either side, there used to shine out a copious glittering light from my shut eyes; then that as my sight grew less from day to day, colors proportionately duller would burst from them as with a kind of force and audible shot from within; but that now, as if the sense of lucency were extinct, it is a mere blackness or a blackness dashed, and as it were interwoven with an ashey grey, that is wont to pour itself forth. Yet the darkness which is perpetually before me, by night as well as by day, seems always nearer to a whitish than to a blackish, and such that, when the eye rolls itself, there is admitted, as through a small chink a certain little trifle of light."

Lambert Rogers (1949) has put forward a plausible suggestion to account for Milton's loss of sight. He does not claim certainty for his retrospective diagnosis, but he does insist that a suprachiasmal cystic tumor, which "died" (that is, underwent spontaneous regression) after it had destroyed the visual fibers, would account not only for the failure of Milton's vision, but

also for the "phosphenes," the frontal headache, and the personality changes. One of Lambert Rogers' patients gave a clinical history remarkably like Milton's. Like the poet, he began to notice failure of sight from the age of 36 years, beginning with loss of the temporal field in one eye, and accompanied by headaches, nausea, irritability, and curious sensations of "colors like balloons." Lambert Rogers was not consulted until five years after the onset of symptoms, by which time the originally affected eye was blind, and the second one had already lost its temporal field. Operation was performed in time to save half the visual field of one eye. A parapituitary cyst about the size of a pigeon's egg was removed; and 16 years later the patient was still able to get about and read with the help of a glass. Without this surgical intervention the man would certainly have become as blind as Milton, unless by any chance the cyst had "died" (undergone spontaneous regression) before compressing the function out of his last visual fibers.

Dr. Johnson the great lexicographer is a puzzling subject for diagnosis in retrospect. We have his own testimony that he suffered from serious eye trouble during infancy, and that he was taken to London at the age of two-and-a-half years to be touched by Queen Anne for the king's evil. We know that he bore the scars of tuberculous adenitis, and that his left vision remained grossly defective. Johnson said of this left eye that "the dog was never good for much." The most likely explanation is that his infantile eye trouble was phlyctenular disease implicating the left eye more severely than the right. If we take into consideration the amount of hard reading and writing done by Johnson in the course of his long life, it seems improbable that the right cornea could have sustained much scarring, but certainly this better eye was more than once attacked by inflammation together with visual failure. Some writers have suggested recurrent iritis as an explanation, especially in view of Johnson's propensity to rheumatism; but attacks of keratitis could equally well account for the trouble, in the absence of any precise clinical record. Whatever may have been the nature of the disease, the amount of residual damage was limited, because Johnson continued to devour books and produce his vigorous script until he died 75 years old.

Sir Joshua Reynolds' portrait of Johnson reading without glasses at the age of 66 years, and holding his book close to the eyes, indicates that he was a myope. Indeed Johnson's friends were accustomed to regard him as short-sighted, and he himself repeatedly acknowledged the defect, although he was apt to flare up at anyone who tactlessly referred to his handicap. Speaking of the aforementioned portrait he said that "Reynolds could paint himself as deaf if he chooses, but I will not be blinking Sam." Reynolds painted him again about seven years later, and it is noteworthy that the worse eye, the left, is not divergent.

Beattie (1953) points out the difficulty of reconciling Johnson's supposed myopia with his proved capacity to observe the details of distant objects. He quotes a passage from Johnson's journal at the time of a visit to Versailles when he was 66 years of age:

"Amongst the birds was a pelican, who, being let out, went to a fountain, and swam about to catch fish. His feet well webbed: he dipped his head and turned his long bill sidewise. He caught two or three fish but did not eat them."

Beattie also points out that Johnson never wore glasses for distant vision, although concave lenses were used in those days by many myopes, including his friend Reynolds. Another difficulty raised by Beattie is Johnson's remark to Garrick:

"I'll come no more behind your scenes, David, for the silk stockings and white bosoms of your actresses excite my amorous propensities."

"Could he have made such an observation with a myopic error of four or five dioptres?" asks Beattie.

If I may borrow an American idiom, I should like to reply: "I'll say he could!"

Surely we must all have come across instances of remarkably acute appreciation of objects beyond reading distance, by people displaying many diopters of myopia. In some instances this achievement derives from exploitation of the stenopoeic slit. Then again, a myope unaccustomed to glasses will often display considerable ingenuity in the interpretation of blurred objects. Such imaginative reconstruction is of course all the more likely among the nimble-witted. The late Mr. Basil Lang assured me that, during the 1914-18 war, he examined the eyes of a Marseilles taxi-driver suffering from 15 diopters of myopia. This man had never worn glasses, and was not complaining of any difficulty at his work. Why should we accept as evidence against a few diopters of myopia, Dr. Johnson's manly response to the allurements of those actresses?

Characters in Fiction

Dickens sets us an easy problem in retrospective diagnosis when he says, concerning an assistant of Mr. Mould, the undertaker in *Martin Chuzzlewit*, that he was "an obese person, with his waistcoat in closer connexion with his legs than is quite reconcilable with the established ideas of grace; with that cast of feature which is figuratively called a bottle-nose; and a face covered all over with pimples. He had been a tender plant once upon a time, but from constant blowing in the fat atmosphere of funerals, had run to seed." Here is an unmistakable picture of rosacea, but no confident diagnosis can be made about the rascally schoolmaster in *Nicholas Nickleby*. "Mr. Squeers' appearance," says Dickens, "was not prepossessing. He had but one eye, and the popular prejudice runs in favour of two. The eye he had was unquestionably useful, but decidedly not ornamental: being of a greenish-grey, and in shape resembling the fanlight of a street door."

If we feel too discouraged at our inability to put a name to Wackford Squeers' condition, we can console ourselves with a far easier problem—that of the Fat Boy employed by Mr. Wardle in *Pickwick Papers*. This monumental instance of Fröhlich's syndrome was offered to the world in 1836, more than half-a-century before the birth of modern endocrinology. The first of the hormones to be recognized was that of the thyroid gland, and then 10 years later Fröhlich (1901) issued his description of pituitary deficiency. Since then the pituitary gland has seized much territory on the pathologic map, and Langdon-Brown (1946) dubbed it "the leader of the endocrine orchestra." An avalanche of cortisone has recently been launched upon the world, so that many patients have come to expect it as routine treatment for almost anything; but apparently the pendulum is now on the backward swing. Already claims about the efficacy of this wonder-drug are being watered down, and the lay public is getting to know the other side of the picture. A determined-looking elderly lady stalked into my room not long ago, saying: "You mustn't order me cortisone. I don t want to grow a beard."

Long before Robert Louis Stevenson popularized the notion of split personality in *Dr. Jekyll and Mr. Hyde*, Dickens made play with the amusing fancy that different facets of character may be revealed in the expression of each eye. Mrs. Todgers, the landlady in *Martin Chuzzlewit*, having been asked to put up Mr. Pecksniff and his daughters at short notice, and having only one bed vacant at the time, embraced the girls, and "stood for some moments gazing at the sisters, with affection beaming in one eye, and calculation shining out of the other." Ocular dissociation was also practiced by that notorious midwife Mrs. Gamp, who welcomed the newly-married Mrs. Jonas Chuzzlewit "with a leer of mingled

sweetness and shyness; with one eye on the future, one on the bride, and an arch expression in her face, partly spiritual, partly spirituous, and wholly professional and peculiar to her art."

Dickens' uncanny power of observation is revealed in his description of the corneal reflex. Thus he says about Ruth Pinch's eyes: "By-the-bye, how bright they were! Looking into them for but a moment, when you took her hand, you saw, in each, such a capital miniature of yourself, representing you as such a restless, flashing, eager, brilliant little fellow." When Dickens noticed, one day in March 1870, that he could not read more than the right-hand half of the names over the shops all the way along Oxford Street, he knew he was seeing the red light. It was not the first time he had experienced this symptom, and his acuteness of perception doubtless rendered it all the more disquieting. Less than three months later he was dead.

Neuro-ophthalmology

Our knowledge of intracranial aneurysms today has arisen from a multitude of detailed clinical studies correlated with post-mortem examinations and other investigations. Diagnosis can now be clinched by arteriography. We know that sudden third cranial nerve palsy associated with severe pain around the inner canthus, but without any other ocular palsy, nearly always means supraclinoid aneurysm of the internal carotid artery. Subclinoid aneurysm is now known to interfere with the fourth and sixth cranial nerves, and to produce anesthesia over the area supplied by the first division of the trigeminal nerve. In former times, however, these cases occasioned much confusion, and among the various labels applied to them were "ophthalmologic migraine" and "sphenoidal fissure syndrome."

Thyrotropic exophthalmia is another disease-state in which the diagnosis can more readily be made nowadays than in former times. The results of treatment are often disappointing, and many of its pathologic features still defy explanation, but fewer cases are now mistaken for orbital tumor. Various items in the literature together with old clinical records suggest that many cases of pseudotumor of the orbit were in reality thyrotropic exophthalmia, and one of my colleagues has seen this condition wrongly interpreted as the effect of ethmoidal disease.

Another colleague has told me of a 70-year-old man who underwent a long course of antisyphilitic mercurial inunction 50 years ago, on the score of his pupils, which did not react to light. He displayed typical tonic pupils—a relatively harmless condition now familiar to most final-year students. Confusion must have arisen in many a similar case. These tonic pupils are occasionally associated in young people with spasm of accommodation, and resulting failure of the uncorrected vision. Probably many a physician and ophthalmologist, on being confronted with defective vision and pupils devoid of light-reaction, was able to persuade himself that he saw tabetic optic atrophy through his ophthalmoscope. Even today it is common to find normal optic discs stigmatized as swollen or atrophic, because the observer, having ascertained the presence of other disease-features, was expecting to find pathologic discs. People bent on completing an imaginatively predetermined chain of clinical signs are capable of the wildest hallucinations.

The assessment of periorbital pain is not always easy, and we should never be satisfied to dismiss it as unexplained neuralgia until we have made a careful examination. One colleague has modestly told me of his own mistake in belittling the neuralgic pains of a highly-strung elderly lady. Two days later she blossomed forth in a typical herpes zoster rash. Examination of eye movements and of the optic discs should never be omitted in cases of severe facial neuralgia, because some organic reason, for example,

intracranial aneurysm, may thus be foreshadowed.

During the last 10 years toxoplasmosis has been increasingly recognized as a cause of infantile convulsions, and, now that the associated fundus lesions have been so exhaustively described, a retrospective diagnosis of toxoplasmosis can be made with confidence from the scrutiny of many old case-records.

The recognition of sixth cranial nerve palsy as a complication of malignant growths of the nasopharynx has been aided by the researches of Godtfredsen (1947). His work has conclusively established that in this condition the sixth nerve is far more often implicated than the third and fourth, and that the most important corroborative signs are secondary glands in the neck together with a palsy of the 12th (hypoglossal) nerve. In former times many such cases were missed until they had reached a late stage.

Thrombosis of the lateral sinus has long been known as a complication of middle-ear disease, but the possibility of a thrombosed sagittal (superior longitudinal) sinus must also be borne in mind. The main clinical effects are vomiting, headache, stupor, and disc edema.

Turning to a malady of the nervous system not based upon any known structural changes, we find that many cases of migraine are retrospectively diagnosed. During the last two or three decades it has become more and more evident that migraine is fairly common among children of school age, but of course many of the victims are inarticulate about their detailed symptoms. Thus numerous adults who were regarded as subject to bilious attacks at school can be shown to have suffered from migraine, if a careful history is taken. It is interesting to note that the original case of Fröhlich's (1901) syndrome was diagnosed as migraine because at first no abnormality of the patient's fundi was visible.

Dermatology

The revolutionary changes that have taken place in dermatology during the last two decades have been of profound interest to ophthalmologists, because the two specialties overlap in countless ways. Thus the eyelids, which are covered by perhaps the most vulnerable skin on the body, are often the first portion of the integument to display allergy to organic and inorganic substances. Then again, we find more and more syndromes (for instance, that of Stevens-Johnson) in which some systemic upset is linked with dermal and ocular changes. Thirdly the implications of psychosomatic medicine are nowhere more apparent than in the skin, so that a state of general well-being is often reflected in the texture of the skin, while on the other hand worry can readily provoke dermatitis or a crop of warts.

The differential diagnosis of skin lesions must have presented great difficulty in patriarchal times, and it is reasonable to suppose that some of the miraculous cures of leprosy recorded in the Bible were misdiagnoses. Incidentally, the horror aroused by this disease probably led to the banishment or segregation of many a patient afflicted with some trivial disturbance of the skin resembling leprosy.

We have already noted that rosacea can be retrospectively diagnosed from a clear description of the victim's face, and this disease also allows scope for retrospective assessment of former therapeutic methods. Thirty years ago many patients were dosed with dilute hydrochloric acid after meals, because they had been observed to secrete inadequate quantities of this substance. Shortly after this treatment had come into vogue, ultraviolet therapy loomed up, and here again remarkable success was claimed. We now realize, however, that hypochlorhydria is not the cause of rosacea, but merely one characteristic (though not invariable) item in the makeup of the victim. The typical rosacea patient is diffident, sensitive,

and highly conscientious. Any new method of treatment, or a new medical attendant who shows sympathetic interest, may act like a charm in reducing the facial efflorescence and relieving the ocular complications. On the other hand fresh outbursts of rosacea have been repeatedly noted to coincide with some domestic crisis or occupational setback. Rosacea affords a most convincing demonstration of psychosomatic medicine. The great Jonathan Hutchinson (1887) knew what he was talking about when he said of dermatology "that beyond all others it offers attraction to the student of the laws of disease and to the seeker after the causes which disturb health and local nutrition." For a long time his teaching was neglected, but now it acquires added significance.

Miscellaneous conditions

Louis Trevelyan, the main character in Trollope's novel *He Knew He Was Right*, epitomizes paranoia. Step by step he proceeds to antagonize his wife, to strangle their mutual affection, and to wreck the marriage because he cannot help conjuring up a desperate situation from a few false premises. Many other characters in fiction have been subjected to the Procrustean régime of modern psychopathology, but such activities are of doubtful value, because the primary object of a novel should be to entertain the reader. In certain Russian novels the main characters are apt to show the wildest alternations of love and hate, trust and jealousy, but the total effect upon the reader is less depressing than might have been expected, because he realizes that the Russian idiom is different, and that gloom has her ecstasies no less renowned than bliss.

Speculation with regard to the various poisons used in history and fiction is handicapped by the fact that most writers, unless they are trained pharmacologists, delight in exaggerating the speed with which drugs can produce a lethal effect. Thus we need not feel unduly puzzled when the hero in a taxicab subsides *immediately* into coma when a handkerchief soaked with narcotic drops over his face.

Among the conditions frequently missed in ophthalmic practice are superficial punctate keratitis, canalicular concretions, Fuchs' epithelial dystrophy, small macular lesions, and conical cornea. On the other hand they are all fairly easy to diagnose when once a single example has been demonstrated to the tyro. The same generalization applies to Tay-Sachs' disease, secondary carcinoma of the choroid, and rubellar retinopathy. Many an ophthalmologist, on first being shown one of those things, will case his mind back and retrospectively diagnose cases which had seemed obscure.

General conclusions

Although we can diagnose, with the aid of modern equipment, maladies which were misinterpreted by our forebears, we have to remember that disease labels tend to change out of all proportion to genuine advances in knowledge. For example, it is doubtful whether the incidence of appendicitis underwent any sudden increase after that condition had been rendered fashionable by Sir Frederick Treves' operation upon Edward VII. Probably most of the earlier cases had been given a different name; but it may also be assumed that, when once appendicitis was on the map, it was made to account for many an ordinary bilious attack. Laparotomy leading to the removal of a normal appendix, and revealing no signs of intra-abdominal disease, must have been witnessed by a large proportion of those engaged in medical practice today.

Angina pectoris as a label for the immediate cause of death has been largely replaced by coronary thrombosis, and although sound reasons can be adduced for this change in nomenclature, it is doubtful whether the present terminology will endure forever. Already the shadow of coronary thrombosis has been lightened because this

state may emerge during routine post-mortem examination of subjects who never sustained a heart-attack during life. Evidently the distinction between end-arteries and other arteries is not so rigid as we used to assume. So long as arterial obliterative changes develop slowly, the supplied tissues can often maintain their function by means of anastomoses, even in the brain, the retina, and the heart-wall. Some of us perhaps at this moment are fashioning alternative pathways for the blood which nourishes our heart-wall, in order to preserve ourselves for a few more years of diagnosis. We should look upon ourselves as privileged to be alive at a time when so many intricate new methods are available for the diagnosis of disease; and if ever we are tempted to smile at mistakes made by the pioneers of medicine, let us ask ourselves whether we should not rather marvel at them for having delved so deep with their primitive spades.

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THE DISINFECTANT ACTION OF CONCENTRATED ACETONE

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Introduction

The use of undiluted acetone for the routine disinfection of surfaces was suggested by unpublished experiments done about 25 years ago by Dr. P. L. Varney, in which it was found that there was a rapid bactericidal effect on both vegetative and spore forms.[1] Although tests of the bactericidal power of diluted acetone have been made,[2-9] we were unable to find any published experiments concerning the action of undiluted acetone and therefore decided to do further work. It was thought that acetone might have considerable practical value for routine disinfection of surfaces, not only because it is inexpensive and readily available but also because it evaporates rapidly at room temperature thereby eliminating undesirable residual activity.

Phenol coefficient

The phenol coefficient of acetone was determined using Micrococcus aureus.[10,11] The values in each of four experiments were 0.03 and confirmed the work of others,[3-9] indicating that diluted acetone is not a strong bactericidal agent.

To test the effect of high concentrations of acetone on the same organism, the same method was used as for the phenol coefficient except that high concentrations of acetone were used and times of exposure were varied. Table 1 shows the results of these tests, and

TABLE 1

EFFECT OF DILUTION ON THE BACTERICIDAL POWER OF ACETONE

Final Concentration of Acetone (percent)	Time: Seconds 5	15	30	60	Minutes 2	3	4	5	10	15	30
95	−	− −	− − − −	−	−	−	−	−			
85	− −	− − −	− − − − − −	− − −	− − −	− − −	− − −	− − −			
75	+ −	+ + + − − −	− −	−	−	−	−	−			
65	+ −	+ + − −	− − −	−	−	−	−	−			
55	+ +	+ + +	+ + + + −	+ − − −	−	−	−	−			
45			+ +	+ +	− − −	− −	−	−	−	−	
35								+ +	+ +	+ + −	− − −

\+ Positive culture of M. aureus.
− No growth.
Each symbol indicates a separate test but not necessarily on the same day.

it is apparent that a rapid bactericidal effect was obtained with the highest concentrations of acetone.

SPORICIDAL ACTIVITY

Strips of filter paper were dipped into a suspension of spores of Bacillus subtilis. After drying, the strips were immersed in undiluted acetone for various periods of time, transferred to tubes of broth and incubated for four days. It was found that viable spores persisted in strips immersed in acetone for four days. Similar qualitative experiments with spores dried on glass beads or on the bottom of test tubes gave essentially the same results.

TABLE 2

EFFECT OF CONCENTRATED ACETONE ON VIABILITY OF SPORES

Time of Exposure	No. of Plates	Colonies per Plate (mean)	Standard Error of the Mean
0	9	185	±6
15 min.	9	164	±6
1 hr.	9	141	±5
1¼ hr.	9	134	±4
5 hr.	4	132	±4

Acetone was used in a concentration of 99 percent; 0.5 ml. aliquots were transferred to each plate and incubation carried out for 117 hours.

A further test of survival of spores in acetone was carried out by a quantitative method.[12] The results are shown in Table 2, where it may be seen that approximately one fourth of the spores were killed in the first hour, but there was no significant reduction in the colony count thereafter ($P > 0.3$). Although not sporicidal, acetone is quite sporistatic, that is, it induces a prolonged lag phase in the growth of spores exposed to it. Incubation for less than three days of cultures of such spores will lead to erroneously low colony counts.

IN SERUM

A suspension of M. aureus in broth was diluted with an equal amount of horse serum, and one part of the resulting suspension was added to four parts of acetone. Subcultures were done at intervals from 15 seconds to 48 hours. Control tubes without acetone remained viable but all other cultures failed to grow.

ON BLOOD CLOTS

The ability of acetone to penetrate clots of blood was tested by mixing a culture of M. aureus with freshly drawn human blood. The clots were immersed in undiluted acetone for five minutes and were then trans-

TABLE 3

DISINFECTION OF SKIN WITH ACETONE

	No. of Plates	Colonies per Plate (mean)	Standard Error of the Mean	Range
70% Ethanol	52	0.98	0.17	0– 7
Acetone	52	31.	7.7	0– 342
No treatment	52	300.	50.	0–1500

Each mean was significantly different from the others ($P<0.001$)[18].

ferred to broth. In every instance, viable bacteria persisted.

On skin

Unwashed fingers of medical students were swabbed with acetone. For control, corresponding fingers of the other hand were swabbed with 70-percent ethanol or given no treatment. As soon as the bactericide had evaporated, each finger was rubbed 50 times over the surface of an agar plate and growth was estimated after incubation for 24 hours. The results, shown in Table 3, indicate that acetone did have a bactericidal effect under these conditions but that it was less effective than ethanol.

As a viricide

In these studies, 0.5 ml. of a 10-percent suspension of mouse lung infected with influenza virus was added to 4.5 ml. of acetone. After 10 seconds, 4.5 ml. of diluent (10-percent horse serum in saline) was added, and the acetone was removed with a vacuum pump within 10 seconds. In a control flask, diluent was substituted for acetone. The suspensions were tested for active virus by administration to mice by aerosol.[13] The 12 mice exposed to the control suspension were dead by the eighth day, but the 12 animals inhaling acetone-treated suspension survived for 12 days, at which time their lungs were free of lesions.

Discussion

Results of the present experiments show that acetone is a more potent bactericidal agent than is indicated by the present literature on the subject and suggest that acetone might have considerable value for the routine disinfection of surfaces. The reason for the poor showing of acetone in previously reported tests appears to be that it was not used in concentrated form, and our tests also confirm its relative ineffectiveness when diluted.

The inability of acetone to eliminate spores is an important disadvantage but most commonly used bactericidal agents are also deficient in this respect.[14]

Although acetone was active in the presence of protein, it did not penetrate blood clots. Therefore, instruments should be cleaned of blood and tissue fragments before using acetone to disinfect them, as with other methods of sterilization.

Rapid destruction of influenza virus by acetone does not necessarily mean a similar action on other viruses but does indicate that further tests would be desirable.

Summary

1. Concentrated acetone exerted a rapid bactericidal effect on M. aureus but was relatively ineffective when diluted as in determinations of the phenol coefficient.

2. Concentrated acetone was not efficient in killing spores of B. subtilis but it was sporistatic.

3. Acetone was active in the presence of serum but did not penetrate blood clots.

4. Concentrated acetone was inferior to 70-percent ethanol in its bactericidal action on the skin in our experiment.

5. Acetone inactivated influenza virus rapidly.

Ophthalmologic applications

Undiluted acetone has been used in ophthalmic office procedures (in the office of L. C. Drews, M.D.) routinely for three years without evidence of damage to sharp instruments.

It is cheap (about $1.00/lb.) and readily available. We have used it freely in the presence of an open flame in the laboratory without mishap but we would not recommend this in the office or operating room.

Because it evaporates very rapidly, acetone is safe to use on eye instruments. A single swish through the air is sufficient to make the acetone evaporate. Any traces which might remain would evaporate completely in a few seconds or, if the instrument were used immediately, would be harmless to the eye.

Acetone on the Mayo table may be used to sterilize instruments which have become contaminated at operation. A five-second dip after wiping the instrument off should be sufficient. It would be much more convenient than the boiling water sometimes so used (on a remote table), and more effective.

For office procedures it is of great value. Gauze may be made safe for minor procedures by soaking in acetone then allowing to dry. Silk sutures may be quickly and easily prepared. Instruments for foreign bodies and chalazia should be sterilized both before and after use.

In our hands acetone was inferior to isopropyl alcohol for use on tonometers because of the latter's slightly greasy property. If the tonometer must be used in a "dirty" case, acetone may be used and the instrument relubricated with isopropyl alcohol. Some ophthalmologists might wish to use both routinely.

Acetone is as good as boiling water for sterilizing syringes and ever so much faster. The syringes should be washed, "dried" by rinsing with acetone drawn up in the assembled needle and syringe unit, and then sterilized with a second internal rinse with undiluted acetone. The plunger is then worked back and forth a few times until all the acetone is evaporated (which one can see plainly) and the unit is ready for use.

Acetone will not kill some spores and may not be effective against the virus of serum hepatitis. In this respect it is no worse than other antiseptics and/or boiling water. It certainly is not as reliable as autoclaving. Therefore, for operative work we believe the nonsharp instruments, silk sutures, and so forth, should be autoclaved.

Acetone can make ordinary sterilizers unnecessary in oculists' offices; we feel that it is a superior antiseptic for use in sterilizing sharp instruments in the operating room.

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THE USE OF CORNEOSCLERAL GUT SUTURES*

Covered by a conjunctival flap in cataract surgery

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The discussion concerning the use of unabsorbable or absorbable sutures in cataract surgery has been put on a solid experimental basis by the excellent work of Dunnington and Regan.[1,2] Silk sutures were found by these investigators to show downgrowth of epithelium along the suture track. Polymorphonuclear infiltration was relatively slight in the beginning but increased until, at the end of the third week, the suture was usually surrounded by an area of necrosis. Fibroblastic proliferation was always decreased in the vicinity of the suture.

When mildly chromicized 6-0 surgical gut was used, there was polymorphonuclear cellular response during the first 72 hours after the operation. From the fourth to the sixth day there was little increase in round-cell infiltration, and fibroblastic proliferation became evident. By the 21st day only small bits of the suture were still present. There was no evidence of necrosis and the fibroblastic repair continued unhindered.

At the end, the fibrous scar was somewhat broader than that observed with silk suturing. Increased vascularization was also noted, a fact which, at least theoretically, might create a disposition for later anterior chamber hemorrhages.

The authors concluded that mildly chromicized surgical gut was a satisfactory material for closing cataract incisions.

Having been skeptical about the use of gut sutures in cataract surgery and encouraged by these reports, I began to use mildly chromicized gut for the corneoscleral sutures in cataract operations. Some clinical advantages in comparison with silk sutures were obvious, as pointed out by previous authors. It is unnecessary to remove gut sutures, thus eliminating all hazards connected with the removal of silk sutures. In nervous and uncooperative patients loss of the anterior chamber, anterior chamber hemorrhages, and iris prolapse are common complications with this procedure.

While appreciating the advantages, I also became aware of some disadvantages. The cut ends of the gut sutures protruding from the cornea often created considerable irritation during the postoperative period. Another unwelcome feature was that at the time the patient was ready to leave the hospital the sutures were not quite absorbed. This also caused prolonged irritation.

I always felt uneasy over the possibility of an infection along the suture track in the presence of an uncovered suture. Indeed, I had the unpleasant experience of seeing a patient who developed panophthalmitis one week after he had been discharged from the hospital by another surgeon. Examination

*Read in part at the Pan-American Congress of Ophthalmology, Santiago de Chile, January, 1956.

with the biomicroscope left no doubt that the infection had developed along the track of the incompletely absorbed suture.

A suggestion made by Roberts[1] that corneoscleral gut sutures might be buried under a conjunctival flap appeared to be worth a trial. Since the technique described by Roberts seemed to be unnecessarily complicated, I developed the following technique:

After the usual preparation and anesthesia, a conjunctival flap is dissected from above. This flap should be about four to five-mm. wide at the 12-o'clock position, gradually becoming narrower as it reaches the limbus at the 3 and 9-o'clock positions. The dissection of the flap not only is carried out down to its insertion at the limbus but it is undermined by splitting the cornea in the manner used when preparing a flap for the Elliott trephining operation.

About one mm. back of the final base of the flap at a line which approximately corresponds to the limbus, a fairly deep but nonperforating incision is made from the 10 to 2-o'clock position. For this incision, a Lundsgaard knife or the Atkinson knife needle may be used.* At about the 10:30 and 1:30-o'clock positions, a mildly chromicized 6-0 gut suture is inserted. The posteriorly directed needle is inserted behind and beneath the conjunctival flap, passed across the groove and through the posterior lip, emerging from the sclera about one mm. posteriorly. A loop is then formed by pulling the suture out of the groove.

I prefer to make a section with the Graefe knife, the latter being passed between the anterior and posterior parts of the loops of both sutures. An assistant prevents the sutures from being cut during the section. Those who prefer the keratome may begin with a keratome incision at the 12-o'clock position and complete the section by passing the scissors between the sutures.

After the cataract extraction is completed in the usual way, the two corneoscleral sutures are tied in a triple knot. The conjunctival flap is then pulled back, thus covering the sutures completely. It may be sutured into place by about five superficial sutures, preferably of unchromicized gut (figs. 1 to 5). If additional security is desired, three corneoscleral sutures at the 10, 12, and 2-o'clock positions may be used instead of two.†

The following details are recommended:

Immediately before the sutures are used, they may be made more easily recognizable and more pliable by soaking in five-percent glycerine to which a few drops of methylene blue have been added. Only small bites of each lip of corneal tissue should be taken. The sutures should be inserted approximately through the middle of the corneal thickness, thus avoiding gapping of the endothelial side of the cornea.

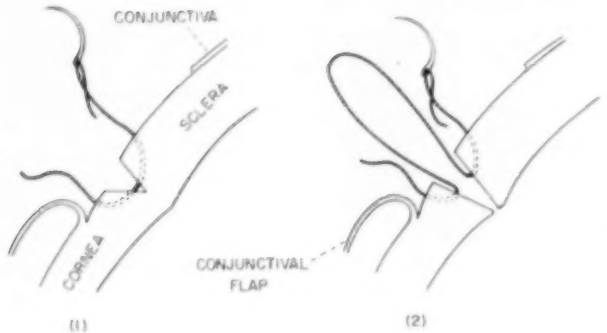
My experience with the described procedure has been satisfactory in over 150 cases. In the first place, this type of suture provides perfect closure and approximation of the wound. Almost immediately after the sutures have been tied, the anterior chamber begins to reform and, in most cases, there is a well-established chamber at the completion of the operation.

The postoperative course is usually very smooth. The external conjunctival sutures become partly absorbed and the remnants slough out within a few days, especially if plain nonchromicized gut has been used. They have always disappeared by the time the patient is ready to leave the hospital.

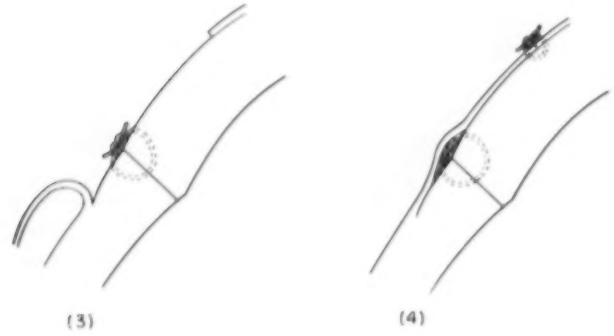
There is no irritating and scratching sensation from the corneoscleral sutures since these are covered by a conjunctival flap which provides for a smooth surface at the site of the sutures. It is well known that corneoscleral silk sutures, on the contrary, often cause considerable discomfort before they can be removed.

* Atkinson, W. S.: A safe section for cataract extraction. Am. J. Ophth., **41**:272, 1956.

† First, special Grieshaber needles were used for this suture. Recently the new Ethicon suture and needle, double cutting Atraloc, C. Medium, 6-0, B-7?0, has been found very satisfactory.



Figs. 1 and 2 (Stocker). The conjunctival flap is dissected from above, and the suture is passed through the anterior and posterior lips of the groove placed above the base of the cap (1). A loop is formed and the section completed (2). Note that the suture is not inserted through the conjunctival flap.



Figs. 3 and 4 (Stocker). After the cataract has been removed, the suture is tied in a triple knot (3), the conjunctival flap sutured back into its original place (4), by that completely covering the corneoscleral suture.

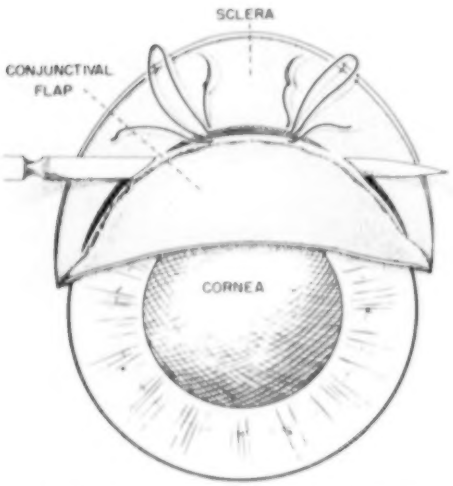


Fig. 5 (Stocker). During the section, the Graefe knife is passed between the anterior and posterior part of both sutures. Note that the conjunctival flap has not been perforated by the corneoscleral suture.

While epithelial downgrowth rarely occurs along the track of a McLean silk suture, it has been observed to occur, as reported by Maumenee.[4] Since the gut sutures herein described have no contact with the surface epithelium, it is impossible for them to promote epithelial downgrowth.

After tabulating the first 100 cases that had been operated in the described manner, it was striking to see that, in 47 cases, the corneal astigmatism was with the rule, that is, the corneal curvature was greater in the vertical than in the horizontal meridian as compared with 31 cases against the rule. This has to be considered proof of tight closure of the wound. Twenty-two cases did not require any astigmatic correction.

The average correction for the group which showed astigmatism with the rule was 1.32 diopters. For the cases that exhibited astigmatism against the rule, it was 1.40

diopters; the average for the whole group being 1.06 diopters. This last figure compares favorably with those reported by McLean[5] for his corneoscleral silk suture, 1.32 diopters, and my own statistics[6] with the same type of suture, 1.24 diopters. The only lower figure that could be found in the literature for postoperative astigmatism was by Roper,[7] 0.91 diopter.

In the present series, there had been one case of iris prolapse in an unruly patient. There was no case of delayed reformation of the anterior chamber, one case of late loss of the anterior chamber, and three occurrences of late shallowness of the anterior chamber. None of these complications had any ill effects on the final outcome.

In five cases, a rather severe anterior chamber hemorrhage occurred during the first postoperative week. This caused serious damage in two instances; one definitely was traumatic. Since Dunnington and Regan had warned that absorbable sutures might dispose to increased postoperative hemorrhages, I was particularly anxious to record even the slightest hyphema observed in the postoperative course. Such a slight hemorrhage was found to be present in 15 cases but disappeared rapidly without any ill effects. In most cases, it was considered a remnant of hemorrhage that had occurred during the operation rather than postoperatively. Nevertheless, the possibility of a slightly increased tendency for postoperative hemorrhage has to be considered. Perhaps this disadvantage might be reduced by making the section as far forward in the cornea as possible.

Summary

A technique using absorbable gut sutures which are buried under a conjunctival flap is described for corneoscleral suturing in cataract surgery. The advantages are:

Quick reformation of the anterior chamber and tight closure of the wound, reduced postoperative irritation, avoidance of all the hazards connected with the removal of sutures, very low postoperative astigmatism, and elimination of the possibility of epithelial downgrowth along the suture track.

A possible slightly increased tendency to postoperative hemorrhage might be reduced by making the section as far forward in the cornea as possible.

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Ophthalmic Miniature

I never knew an instance of a man becoming eminent, respectable, or even wealthy in the profession of medicine who was deficient in punctuality in letter writing.

Benj. Rush, *Letter to James Rush*, Nov. 18, 1803.

THE RESISTANCE TO DEFORMATION

OF THE TISSUE OF THE PERIPHERAL IRIS AND THE SPACE OF THE ANGLE OF THE ANTERIOR CHAMBER

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New York

INTRODUCTION

The dominating and clinically well-founded opinion of today attributes the attack of high pressure in narrow-angle glaucoma to closure of the angle of the anterior chamber, usually starting with circumferential contact between iris and cornea at the entrance of the angle space. Many factors have been proposed to explain development and maintenance of closure and reopening of the angle. These hypotheses do not explain sufficiently the rapid opening of the whole angle, as manifested by rapid drop of pressure after an attack in early narrow-angle glaucoma, and the good results of a small peripheral iridectomy in preventing attacks of high pressure.

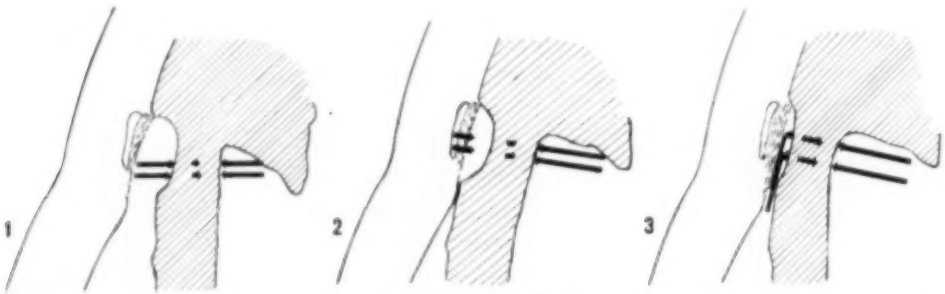
ROLE OF THE RESISTANCE OF PERIPHERAL IRIS IN ANGLE OF NORMAL EYE

A factor which, to my knowledge, has not been considered in the mechanism of closure and reopening of the angle is the resistance to deformation of the tissue of the peripheral iris, which forms the posterior wall of the angle space of the anterior chamber. This resistance, as small as it may be, is a main factor in keeping open the angle of the normal eye.

The pressure in the chambers of the eye decreases in the direction of aqueous flow from the places of production of fluid to the places of outflow, and is, therefore, lower in the angle of the chamber at the anterior surface of the peripheral part of the iris than behind this part of the iris. It is the resistance of the tissue of the peripheral part of the iris which, together with the pressure in front of this part of the iris, balances the pressure from behind and keeps the angle open (fig. 1). It is the only factor assuring an open angle after elimination of the pull of the sphincter of the iris by atropine.

ROLE IN NARROW-ANGLE GLAUCOMA (ANGLE-CLOSURE GLAUCOMA)

After circular closure at the entrance to the angle, a ring space is separated from the main part of the anterior chamber. The pressure in this ring space is no longer sustained by the pressure of the anterior chamber but only by the pressure of the communicating canal of Schlemm. The pressure from behind



Figs. 1 to 3 (Kessler). (1) Balance of forces acting on the peripheral part of the iris when the angle is open. (2) Lack of balance of forces in closure of the entrance to the angle space, resulting in compression of this space. (3) Reopening of the angle space after opening of the entrance, with restoration of the balance of forces.

the peripheral part of the iris, rising by obstruction of outflow, is higher than the sum of opposing forces, that is, pressure in the canal of Schlemm plus resistance of the tissue of the peripheral part of the iris; so this part of the iris is pressed to the anterior wall of the ring space (fig. 2). This mechanism has been described in essence by Posner[1] as the "suction theory."

The pressure difference active on the anterior and posterior surfaces of the peripheral part of the iris displaces this part of the iris anteriorly and presses it to the anterior wall of the ring space. Because of the resistance of the tissue of the peripheral part of the iris, a part of the pressure difference acting on it acts on the line of contact at the entrance tightening the contact as long as the ring space is not yet compressed completely. The pressure difference may be regarded as a pressure acting on the side of higher pressure or as "suction" acting from the side of lower pressure. By contact between iris and anterior wall of the ring space an adhesional force arises between the surfaces of these structures.

As long as the closure of the entrance of the angle space is complete, this status is maintained. If a small part of the circular adhesion at the entrance is reopened by some cause, the fluid entering this part of the angle space and gaining access to this part of the trabecula will have a pressure which can be lower than the opposing pressure from behind, to which the adhesional force between the walls of the compressed angle space is added.

The rapid opening of the whole ring space with access to the whole trabecula, suggested by clinical experience, can be explained by the force in the deformed tissue of the peripheral iris which, together with the pressure of the fluid entering from the anterior chamber, surpasses the pressure from behind plus adhesional force (fig. 3).

The peripheral part of the iris behaves like a rubber cap pressed to a window pane. Opening of a small part of the attachment of the border makes the whole cap leap up. The resistance of the tissue of the peripheral part of the iris will decrease with the damage caused to the tissue by repeated attacks, resulting in atrophy of the tissue. It may be this factor rather than uveitis or endothelial dystrophy which prevents rapid solution of an attack in acute glaucoma of long standing. Early surgery seems, therefore, advisable in this type of glaucoma.

Relation to surgery of narrow-angle glaucoma (angle-closure glaucoma)

A small iridectomy connecting the ring space with the posterior chamber will assure in the ring space a pressure almost as high as in the posterior chamber which, together with the resistance of the peripheral part of the iris, will prevent compression of the ring space. Similarly a groove in the anterior surface of the iris or posterior surface of the cornea, which passes from the main space of the anterior chamber to the angle space and which is not closed when the iris is attached to the cornea at the entrance of the angle space, will prevent compression of the angle space, as suggested by Posner[2] who found peripheral crypts in the iris of eyes with narrow angles and without attacks of high pressure, while the other eye of the same persons had attacks of high pressure. These crypts were situated at the angle entrance and seemed able to form a connection between the angle space and the anterior chamber proper.

Surgery producing grooves of this kind on iris or cornea could be effective in narrow-angle glaucoma. Surgery of this kind would not alter the normal route of flow of aqueous, in contrast to iridectomy by which a large part of fluid produced in the posterior chamber is diverted through the opening in the iris.

In iridectomy, the nourishing flow of the aqueous does not bathe equally the anterior surface of the lens, where the main part of the exchange of fluid and of dissolved substances between lens and surrounding tissues probably takes place. It is not impossible that changes in the flow of aqueous could influence

the nutrition of the lens. The normal flow of aqueous periodically opens up the physiologic adhesion between the pupillary margin of the iris and the anterior surface of the lens. The impairment of this mechanism by iridectomy could be a factor favoring the formation of posterior synechias.

A very narrow communication from anterior or posterior chamber to the ring space permits normal rate of flow of aqueous. Otto Barkan[3] found closure of four fifths of the entrance of the ring space with maintained ring space and normal tension of the eye. One single crypt of the iris in the right place seems to assure normal rate of flow and normal tension. Calculation according to the law of Poiseuille shows that a remaining canal of communication with a radius of 0.1 mm. and a length of 1.0 mm. permits the passage of the normal flow—generally accepted as about 3.0 cu. mm.—if the pressure in the ring space is one hundredth of one mm. below the pressure in the communicating space.

As long as the resistance of tissue of the peripheral iris is normal, therefore, a very small connection between ring space and anterior or posterior chamber is sufficient to open up the whole ring space and to keep it open and to assure normal rate of flow, normal access of fluid to the whole trabecula, and normal intraocular pressure. When the resistance of the peripheral iris is decreased, even a wide communication between the ring space and the anterior or posterior chamber will not open the ring space and will assure access of fluid only to the part of the trabecula near the communication. A communication between ring space and a space of low pressure will work against opening of the ring space.

The resistance of the tissue of the peripheral iris will open the angle space and keep it open, if the difference of pressures on the surfaces of the peripheral iris does not surpass a certain value, which can be balanced by the force arising in the tissue from deformation.

Summary

1. The resistance to deformation of the tissue of the peripheral iris is a factor in keeping open the angle of the chamber in the normal eye.

2. It is a factor in opening the closed chamber angle rapidly and completely after attacks of high pressure in narrow-angle glaucoma.

3. Decrease of this factor after many attacks of narrow-angle glaucoma may be a cause of the difficulties arising in narrow-angle glaucoma of long standing.

4. Early surgery may prevent decrease of this factor.

5. A minimum communication between angle space and anterior or posterior chamber is sufficient to assure normal rate of flow and normal intraocular pressure.

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CLINICAL PATHOLOGIC CONFERENCE*

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CASE HISTORY§

A 17-year-old school boy consulted an ophthalmologist because of severe frontal headaches and loss of visual acuity in the left eye.

Present illness. Two months previously the patient had noted the onset of severe frontal headaches occurring once a week. The headaches became more frequent (two or three a week) and were accompanied by nausea and vomiting which was not of projectile character. The ophthalmologist observed a mass protruding from the optic disc into the vitreous and referred the patient to the hospital. A month later enucleation was performed because of growth of the mass and and virtual blindness of the left eye.

Past history. The patient had always been a fair student and had never failed in school. He gave no history of neurologic disturbance or convulsions. There was no familial history of similar ocular disease.

Physical examination. The head was symmetrical. There was a papular rash across the nose and on the malar eminences. External examination of the eyes showed no significant abnormalities. The visual acuity of the right eye was 20/20 while the left eye was blind.

Ophthalmoscopic examination revealed a normal fundus on the right while on the left a growth was seen protruding into the vitreous from the left optic disc. The tumor was described as large, white, and granular. No other changes were described in the fundus. Funduscopic examination repeated two weeks later showed rapid growth of the lesion. The blood pressure was 130/85 mm. Hg, the heart was not enlarged, and there were no murmurs. The lungs were clear and no masses or organs were palpable in the abdomen. No neurologic disturbances were recorded other than the visual loss.

Laboratory studies. The spinal-fluid pressure was not elevated and Queckenstedt's reaction was normal. Serologic, colloidal gold, cytologic, and chemical studies on the spinal fluid were within normal limits. Intravenous pyelographic studies revealed both kidney shadows to be enlarged to twice the normal size. After excretion of the dye the collecting systems were outlined well. There was marked deformity of the calyces on both sides, believed to be characteristic of polycystic kidney disease.

DIFFERENTIAL DIAGNOSIS

DR. WALSH

This case that I have been given concerns a 17-year-old boy whose eye was enucleated. You have the case summary in front of you. I should like to draw your attention to what I think are important considerations suggested by it. The chief complaint of this boy was given as headaches, frontal in type, present for three months. First, the headaches occurred once a week, then two or three times a week, and there was some nausea and vomiting. The history gives no clues regarding etiology of the headaches but, since the spinal fluid pressure was not

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§ From the Registry of Ophthalmic Pathology: AFIP Accession No. 511046.

increased and the headaches occurred only twice a week, it would seem unlikely that they contribute much to the diagnosis. So I eliminated the headaches as having any particular importance in this case. If they had been considered important, they should have been stressed more.

In addition to the headaches there was blindness of the left eye when the patient was admitted to the hospital, and a mass was seen protruding from the optic disc. This mass is referred to subsequently in the summary as a "growth" and then again as a "tumor."

It was described as large, white, and granular. Furthermore, it is stated that in two weeks' time there was a rapid growth of the lesion. Presumably the fundus of the affected eye was quite normal except for the mass originating in the disc. If this is true, then it would seem most unlikely that it could be an inflammatory mass.

The mass was white and granular. It could not then be a melanoma arising from the disc, at least not a pigmented melanoma.

I am truly disturbed by the statement that the mass increased markedly in size during the period of two weeks. No ophthalmologist has an extensive experience with tumors originating in the optic disc. At Johns Hopkins, for 18 years, the number of tumors originating in the optic disc and the number of intrinsic tumors of the optic nerve amounted to a dozen cases. There is no one who has had a very extensive experience with tumors originating in the optic disc and growing into the vitreous. Certainly the growth of most of these tumors is not as rapid as is indicated here. It could be detected in two weeks' time! Furthermore, it is difficult to understand the term "granular" when used to describe a tumor. For the time being, I am going to discontinue my interest in the tumor.

There was a papular rash across the nose and on the malar eminences. If this is of importance in the diagnosis, the "rash," so-called, might represent adenoma sebaceum which is associated regularly with tuberous sclerosis.

General physical and neurologic examinations revealed nothing other than the ocular affection. If we accept all this as factual, it would follow that in all probability the mass in the optic disc was not metastatic in origin. Examination of the spinal fluid seemed reasonably complete; it seemed to be sufficient to eliminate increased intracranial pressure, particularly when it was stated that the fundus of the right eye was quite normal.

The presence of polycystic kidney disease is of interest. I am doubtful that this abnormality can be directly related to the condition which this boy exemplifies. However, developmental abnormalities of many and varied kinds may be associated with tuberous sclerosis or others of the phakomatoses.

I am sure one should be able to make a diagnosis from the available information. It is noteworthy that no mention is made of roentgenograms of the skull. Such X-ray films might make it clear that this is a case of tuberous sclerosis or they might indicate another diagnosis. Enlargement of the optic canal would be an unlikely finding in tuberous sclerosis and a probable finding in glioma which has extended along the optic nerve. In tuberous sclerosis, there is likely to be involvement of the bones of the skull indicated by areas of increased density; also there may be so-called "brain stones" about the ventricles.

It seems to me that the summary could contain a statement regarding the reason for removing the eye. Was it a purely diagnostic procedure? Was the eye white and was the tension normal? If the answer to these questions is in the affirmative, then certainly the tumor in the eye was not the cause of the headaches. Finally, did removal of the eye do anything more than help in the diagnosis, and did it do this?

I think it is probable that this represents a case of tuberous sclerosis. However, I believe it would be remarkable to have total blindness in an individual with tuberous

sclerosis, because in those cases that I have seen and in those that I have read about, blindness is not characteristic of tuberous sclerosis. If it is reported, I have missed the reports. The visual acuity sometimes is very low, but vision is not completely lost. This would be an unusual history for glioma; usually tumors of the optic nerve are astrocytomas or oligodendrogliomas. This could be a glioblastoma multiforme, but I think the chances are that it is tuberous sclerosis.

Dr. Zimmerman. Are there any questions for Dr. Walsh? Does everybody agree with Dr. Walsh?

Question. I wondered if that granular appearance—that white mass—could be a cysticercus?

Dr. Walsh. I suppose it could as far as the eye is concerned. It could be a cysticercus, but it seemed to me that we actually had three things to support the idea that this might be tuberous sclerosis.

First of all, the mass grew out of the disc. This was a definite statement—that it grew out of the disc.

The second was that there was a papular rash across the face in the exact position in which adenoma sebaceum of tuberous sclerosis is observed.

The third thing was the associated cystic kidneys. The summary stated these were known to be definitely cystic kidneys, and such defects are by no means uncommon in individuals with tuberous sclerosis. That's why I picked tuberous sclerosis as my best bet.

Dr. Zimmerman. Dr. Walsh, I was puzzled by your earlier statement that you didn't think the kidney lesion was associated.

Dr. Walsh. I meant from a neoplastic standpoint.

Question. Are these spinal fluid findings, which are absolutely negative, very unusual in your experience?

Dr. Walsh. Not at all! I think that in the vast majority of cases of tuberous sclerosis, negative spinal fluid findings would be quite consistent with the diagnosis. It just happens that the very first case of tuberous sclerosis that I ever saw was in an individual in whom the diagnosis was missed and the mass was removed from the cerebrum because the patient had very greatly increased intracranial pressure and bilateral choked discs, as well as other evidences in the eye of tuberous sclerosis. That is the first case I ever saw but, since then, I have seen a good many cases of tuberous sclerosis, and it just happens that I haven't seen any others with increased intracranial pressure or any change in the spinal fluid so far as I know.

Question. The patient's mentality was apparently normal. Do you think that militates at all against the diagnosis?

Dr. Walsh. It is a fact that a good many of these people are a bit queer, but I have one patient who has almost completed his studies for the priesthood and I am quite sure, therefore, that his mentality is at least average. Most individuals with tuberous sclerosis are not mental giants by any means!

Question. So often these tumors are cystic—partly cystic. If there were an increase in the cyst content could the fluid not have increased suddenly?

Dr. Walsh. That is a very interesting question. If this were tuberous sclerosis, for example, it is quite true that we often find cystic masses—van der Hoeve described that very well—and these cystic masses are in the retina. I have seen one such cyst empty and fill again. Although I would not say that cystic masses do not occur in the nervehead, the only such thing that I am familiar with is hyaline bodies in the nervehead. I would see no reason that they would suddenly multiply in two weeks' time.

Question. Dr. Walsh, in reading your book, I think that one of the possibilities you mentioned under differential diagnosis of von Hippel's disease was glioma. Well now, turning that around, would you have considered von Hippel's in your differential diagnosis? Do you ever find a mass that is close to the optic disc in that disease?

Answer. Yes, I think you do. I think you may get an angiomatous mass close to the optic disc, but, again, this mass was said to come out of the optic nervehead and to be white and granular, so I took that as stated.

Diagnoses

Dr. Zimmerman

Of the 33 persons who submitted diagnoses for this case, 14 gave tuberous sclerosis as their first choice and two others suggested drusen of the nervehead. Other diagnoses offered were glioma of optic nerve (four), retinoblastoma (three), melanoma of disc (one), metastatic tumor (five), metastatic abscess (one), and von Hippel-Lindau disease (three). Dr. Walsh, would you care to comment on these suggestions?

Dr. Walsh: I am very much interested in the second one, drusen of the nervehead. I have never seen hyaline bodies in the nervehead that accounted for complete loss of vision. I have seen the fields narrowed down to a few degrees. I have seen all sorts of cuts in the field but I have never seen complete blindness.

Some years ago I wrote to Dr. Wilbur Rucker of the Mayo Clinic because he has done more work on this condition than anybody in this country. I asked him this question, "Do these people with hyaline bodies ever go blind?" He said he had not been able to find one that has gone blind. Some of his patients have had concentric contraction, central field defects, defects in nasal fields particularly, but never blindness. Glioma of the optic nerve—I certainly will persist in the idea that such a tumor would not have grown so rapidly in two weeks.

Retinoblastoma? I confess to lack of knowledge here about retinoblastoma and the optic disc. I think it would be exceedingly rare to have a retinoblastoma growing out of the optic nerve.

Melanoma of the optic disc? The color is wrong for a pigmented melanoma.

A metastatic tumor? I think that in my summary I fairly well eliminated that. A metastatic abscess in the optic nerve? Maybe, I don't know. It is one thing that could grow rapidly. Von Hippel-Lindau—I didn't think so for the reason that I have already emphasized.

Currently, I am studying one of the most amazing cases of optic-nerve tumor that I have ever seen. This patient I saw first 17 years ago when he came to Hopkins. There was a tumor growing out of the nerve of one eye. After fussing around with it for a while, I advised him to come back for enucleation of the blind eye. Well, he came back. His return visit, however, was 17 years later, and the mass in the blind eye was essentially unchanged. But he had gone ahead and developed complete loss of the temporal field in the opposite eye and had profound optic atrophy in that eye. He had no proptosis whatsoever, and no pronounced change in the optic canal. I took this eye out, and he had a meningioma of the optic nerve and optic disc. The neurosurgeons found the meningioma encasing the optic nerve and the chiasm. So these tumors can extend from the orbit, or to it, without any material change in the optic canal. I was interested to find that Cushing described the same thing in his book on meningiomas years ago.

Pathology

Dr. Zimmerman

Dr. Walsh makes it very difficult for me to call this anything but *tuberous sclerosis*, and this is my diagnosis.

Here is the gross specimen (fig. 1). This eye was opened in the horizontal plane. This is the temporal side. Here overlying the nervehead is a rounded mass; it doesn't look so granular here. You will notice that there seem to be some small retinal lesions in addition to the main mass over the nervehead (fig. 2). Here is this body which is not immediately over the disc but is actually straddling the temporal half of the disc and the adjacent temporal retina (fig. 3). Now then, look out here (fig. 4)—something that

Fig. 1 (Zimmerman and Walsh). Gross specimen opened in horizontal plane exposing hemispherical mass over optic disc. (Armed Forces Institute of Pathology Accession No. 511046.)

wasn't noted in the clinical description—a little lesion out in the nerve-fiber layer of the retina. This is the retina between the retinal lesion that you saw on the right and the mass over the nervehead (fig. 5). The main point here is that there is practically no nerve-fiber layer—nor any ganglion cells—in this retina. The rest of the architecture is remarkably well preserved. Thus, there is extreme atrophy on the temporal side of the retina.

The next slide will show you the nasal half of the disc (fig. 6). Here we can see that although the lesion obscures the nasal half of the disc, it is really just arising from the temporal half. This is in contradistinction to what Dr. Reese has said about these drusen—that they usually occur on the nasal side. This one was definitely arising from the temporal side, and the nasal retina is remarkably well preserved.

I was interested in Dr. Walsh's comments relative to the rarity of blindness in tuberous sclerosis. The ophthalmologist who contributed this case to the Registry kindly checked his records for us and found that the patient had had only light perception at the time of enucleation. No visual field studies were made. I suspect that this patient had vision from his nasal retina because it is intact. The next slide will show it better. The disc is intact and so is the nerve on the nasal side. Here is the nasal retina which does show a good nerve fiber layer, a good ganglion cell layer, and completely normal architecture (fig. 7). So I am quite surprised that this patient was blind.

This is the peripheral lesion from this case (fig. 8). You will notice that it is entirely on the inner side of the ganglion-cell layer. It involves the glial tissue in the nerve-fiber layer, and those who have studied similar lesions by means of special stains have come to the conclusion that they are in the astrocytic series.

This is another lesion found in the far periphery which again was not described

Fig. 2 (Zimmerman and Walsh). A giant drusen arises from the temporal half of the disc and from the adjacent retina. The empty spaces within the drusen are artefacts produced when calcareous deposits were dislodged during sectioning. In the nerve-fiber layer of the temporal retina there is a plaquelike glial nodule. (×11.)

Fig. 3 (Zimmerman and Walsh). Anterior section of the giant drusen showing a mass of metaplastic tone (h) from the adjacent choroid. (×23.)

clinically, and I apologize to Dr. Walsh, but the history was given as we received it. It has been reported in published cases, too, that lesions can be found in the retina microscopically when they have been missed clinically. Further evidence that a lot of these are missed is the great variation in statistics that have been published. Van der Hoeve, you will remember, had six patients and found lesions in all 12 eyes of these six patients. Others, however, have published series which include over 60 cases with only

Fig. 4 (Zimmerman and Walsh). Superficial glial plaque in nerve-fiber layer of temporal retina. (×50.)

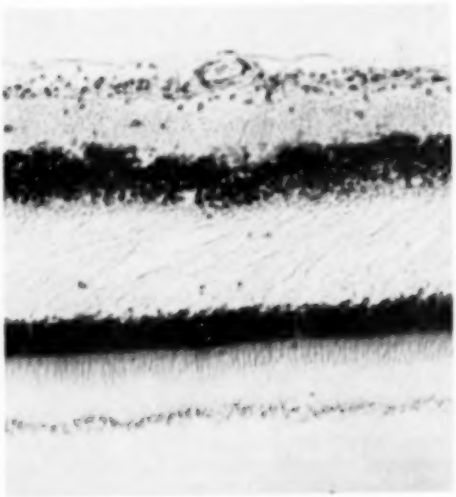

Fig. 5 (Zimmerman and Walsh). In the temporal retina there is extreme atrophy of nerve-fiber layer, degeneration of ganglion cells, and gliosis of ganglion cell layer. There is edema of the outer plexiform layer but the retinal architecture is otherwise well preserved. (×195.)

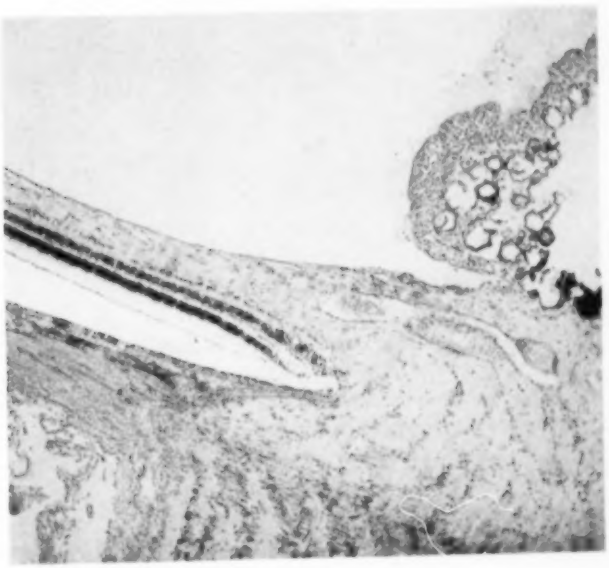

Fig. 6 (Zimmerman and Walsh). Nasal half of optic disc is partly obscured by overhanging drusen which arises from temporal half. There is no atrophy of nasal half of disc. (×62.)

two or three that had retinal lesions. I think it depends partly on whether an ophthalmologist or a neurologist is studying the patient, but even when it is an ophthalmologist he doesn't always pick up these peripheral lesions.

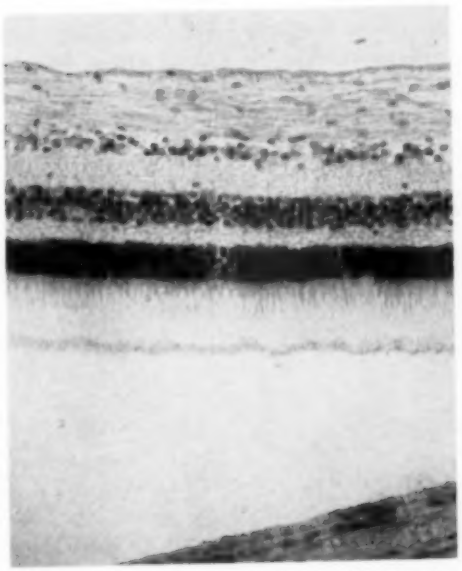

Fig. 7 (Zimmerman and Walsh). Nasal retina has a well preserved architecture with no significant atrophy. Compare with Figure 5. (×195.)

Dr. Walsh wondered whether the diagnosis may have been established even after removing this eye. In my opinion, I think we can state almost unequivocally that this patient has an incomplete form of tuberous sclerosis. This is the lesion from the peripheral retina of this patient. Now I'd like to show you the next two slides which will be from eyes removed from a patient who died with tuberous sclerosis. This patient had no lesions of the disc, but had bilateral retinal lesions. Here you see a little peripheral nodule, exactly like the one in our case, and the next slide will show you another one of these at a higher power. These lesions involve the nerve-fiber layer and are made up of elongated glial cells. Now let's go back to the lesion of the disc.

This is the lesion as we see it—half of it arising from the temporal disc, half of it arising from the retina on the temporal side of the disc. This lesion involves the whole thickness of the adjacent retina and, as a matter of fact, metaplastic bone is invading the lesion from the choroid in this area (fig. 3). The bulk of the lesion is formed by these calcific deposits (fig. 9). Under greater

Fig. 8 (Zimmerman and Walsh). A small superficial conical nodule of glia in the peripheral retina. (×48.)

magnification, there is some proliferation of retinal pigment epithelium, and some glial proliferation. I fully agree with Dr. Walsh, however, that it is inconceivable that this lesion had grown rapidly in the two or three weeks preceding the enucleation. I see nothing here histologically that would make me believe that this lesion had been growing rapidly.

This slide does show the one area in which there is some glial proliferation (fig. 10). These large cells look like immature glia, perhaps astroblasts? This part of the lesion was probably growing. However, the rest of the lesion is practically acellular.

Here we see an area where there is marked proliferation of the retinal pigment epithelium and that, incidentally, may also be observed in the peripheral retina, representing one of several types of lesions that may be encountered. It is said to mimic the lesions of retinitis pigmentosa because of this proliferation of retinal pigment epithelium.

Dr. Walsh mentioned that if a lesion is found over the disc region in a patient with tuberous sclerosis, it will be one of these giant hyaline bodies. There are exceptions. This is a case of Dr. John McLean's that is illustrated in Dr. Reese's book. This came from a patient who was only six months of age at the time of enucleation. At that early age the patient had not yet shown clinical manifestations of tuberous sclerosis and the retinal lesion was thought to represent retinoblastoma—hence the enucleation. Subsequently, the patient had to be institutionalized because of tuberous sclerosis. But the point that I want to make here is that this lesion over the disc was composed of proliferating glial tissue without the hyaline bodies, without the calcific bodies, without

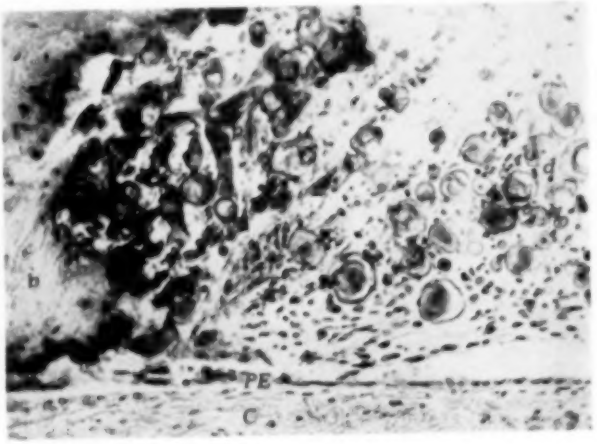

Fig. 9 (Zimmerman and Walsh). A portion of the drusen arising from the retina at the temporal disc margin showing metaplastic bone to far left (b), proliferating pigment epithelium centrally (p), and calcareous deposits to right (d). The retinal pigment epithelium (PE) and choroid (C) are seen along the lower margin of the photograph. (×220.)

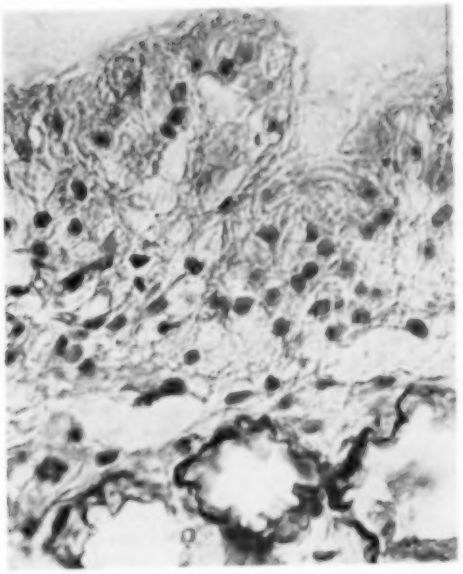

Fig. 10 (Zimmerman and Walsh). Nasal surface of the drusen containing large protoplasmic glial cells probably belonging to astrocytic series. (×490.)

the osseous metaplasia, and without the proliferating retinal pigment epithelium. These all probably represent secondary changes which will not be seen in early lesions of very young individuals.

There are one or two points that ought to be brought up for discussion. One is that this case, to my knowledge, is almost unique. One of van der Hoeve's original patients apparently had a "rapidly growing tumor" in the disc region that was the cause of enucleation of the eye. Then there was Dr. McLean's case already cited. With those exceptions, in an admittedly very incomplete review of the literature, I have not come across other references to cases of tuberous sclerosis that presented a picture of "rapidly growing disc tumor" and required enucleation of the eye. Actually, there are very few reports of histologic examination of the eye in tuberous sclerosis. Most of the reports are clinical, and the histologic reports that are available are largely from autopsy material.

Somebody brought up the question of diagnosis in the absence of the triad of epilepsy, mental retardation, and adenoma sebaceum. Well, this patient had one of the three classical features, but there are many other cases in the literature where the complete picture is not found. So I don't think that should disturb us too much in making the diagnosis in this case. It seems well established that any of the main triad in combination with tumors of the brain, retina, heart, or kidney should suggest tuberous sclerosis. In such cases the presence of café-au-lait spots, subungual fibromas, shagreen skin, leukoderma, roentgenographic densities in the calvarium or other flat bones, and cystic changes in the phalanges lends added support to the diagnosis.

Likewise the lack of a familial history does not exclude tuberous sclerosis. Although Dickerson found several reports describing tuberous sclerosis in three generations, he was impressed by the paucity of published cases in which more than one member of the family was affected. Frequently, other members of the family will have only minor stains that are not obvious to the casual observer. For example, in the recently reported case of Tarlau and McGrath, information was obtained about 53 members of the patient's family, none of whom showed mental deficiency, adenoma sebaceum, or convulsion seizures. However, three of four close relatives available for examination had a single, black, pinhead-sized spot in the temporal periphery of one fundus. These resembled the nevoid spots described by Salom as one of the four pigmentary lesions which may be observed in the fundi of patients with tuberous sclerosis.

Finally, I should like to say something about terminology and classification, calling to your attention the important papers of Moolten and of Ross and Dickerson. Moolten summarized his concept of the nature of the disorder as ". . . a widespread developmental anomaly, often hereditary, in which the primary abnormality lies in the faulty differentiation of tissues rather than

of body units (although the latter may be included). The individual lesions represent the characters of hamartomas, regardless of their situation. Because other organs are involved simultaneously with the brain, the term tuberous sclerosis, which refers only to the cerebral lesions, should be reserved for these and should not be employed to designate the syndrome as a whole. For the latter, the term disseminated hamartiosis (Bourneville type) may be suitable. . . ."

Other examples of disseminated hamartiosis which are of concern to ophthalmologists are von Recklinghausen's neurofibromatosis, von Hippel-Lindau disease, and the Sturge-Weber syndrome. The basic concept is not new, since van der Hoeve long ago expressed the belief that these disorders were related pathogenetically and suggested the term "phakomatoses" for the group. This term (phakomatoses) has gained widespread usage in the ophthalmic literature but is encountered rarely in general medicine or pathology. Even some of the standard medical dictionaries fail to give this definition of the term "phakoma" or "phakomatosis." Hence my preference for the terms "hamartoma" and "disseminated hamartiosis" based upon "hamartia" which signifies a defect in tissue combination.

Question. Could the blindness have been due to an intracranial lesion of tuberous sclerosis?

Dr. Zimmerman. Well, if that were the case, I would expect to see some effects of that: severe atrophy of the nerve and atrophy of the retinal nerve-fiber layer. As I said, the histologic picture on the nasal side seems essentially normal. If there is something that is going to cause blindness it ought to cause atrophy, and atrophy was present only where it could be accounted for by the disc lesion on the temporal side.

Acknowledgement

This most interesting case was contributed to the Registry of Ophthalmic Pathology by Dr. James F. Gavin of Shreveport, Louisiana. Dr. Gavin has provided the following follow-up history:

Three years after enucleation, the patient was readmitted for further studies. He complained of episodes of dizziness relieved by sleep, and intermittent occipitoparietal headaches. He denied convulsive seizures and there was no evidence of mental deterioration. In addition to the typical adenoma sebaceum of the face, there were other papillary skin lesions about the fingers and toes and in the right groin. In 1953, biopsy of one of these cutaneous lesions was interpreted by Dr. Fred D. Weidman as adenoma sebaceum in epiloia. A neurosurgical consultant found no evidence of neurologic disorder.

In the right fundus approximately three disc diameters to the temporal side, there was an elevated, whitish, mulberry-like lesion one-half disc diameter in size. A spinal tap yielded clear fluid under normal pressure. The results of most of the laboratory studies were negative. There was evidence of impaired renal function. Pyelograms showed signs of bilateral hydronephrosis. Fine miliary nodular shadows were observed in the chest X-ray and a calcific deposit measuring 0.5 cm. in diameter was present in the posterior fossa in the skull X-ray films. When last heard from, the patient was gainfully employed.

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THE EFFECT OF SOME NEWER GANGLIONIC BLOCKING AGENTS ON ACCOMMODATION*

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Ganglionic blocking agents have been used clinically for nearly 10 years. The first and best known compounds were methonium salts which were used for their effect on the blood pressure. They lower the blood pressure more effectively in hypertensive patients than in normotensive persons. Their effect is enhanced after sympathectomy or after a salt-free diet and the fall in blood pressure is influenced by posture, being greatest when the patient is standing. Among the side effects are decreased gastric secretions and decreased intestinal motility resulting in an annoying constipation.

The ocular effects of these methonium compounds are manifold. There is sometimes a drop in the intraocular pressure parallel to the fall in blood pressure. This effect has been utilized in treating some patients with glaucoma.[1] However, the effect is shortlasting and the drug has to be given parenterally as oral absorption is extremely poor. It is totally unsuitable for a long range treatment of glaucoma and even its value as a pressure-reducing agent prior to an antiglaucomatous operation in an eye with high intraocular pressure[2] has been nullified by the advent of much more innocuous drugs such as Diamox. Other ocular indications of methonium compounds are of certain interest. The low intraocular pressure was found to be of advantage when performing cataract extractions in young patients[3] or when a bloodless operative field is highly desirable.[4] It has also been used in the treatment of central retinal artery occlusions.[5]

On the other hand some deleterious effects on the eye after the use of a ganglion blocking agent have been noted. The cycloplegic effect has been mentioned[6] and the disastrous result on vision has been recently reported by Bruce.[7]

We are here more concerned with the effects on accommodation. Newer compounds are well absorbed after oral administration and have a long-lasting effect.

* From the Department of Ophthalmology, College of Medicine, State University of Iowa, and the Veterans Administration Hospital, Iowa City. Presented at the Midwestern Section Meeting of the Association for Research in Ophthalmology in Chicago, March 17, 1956.

They can therefore be used in ambulatory patients. The effect on the circulation seems to be identical with that of the methonium salts though the dosage is smaller and the duration of action longer. They are also true ganglionic blocking agents diminishing all nervous transmissions at the autonomic ganglia. While the sympatholysis is the beneficial part of the action, the parasympatholysis is the undesirable but unavoidable part. It accounts for most of the unpleasant side effects, such as dry mouth, constipation, difficulty with urination. Unfortunately, these side effects have to be endured as long as the true sympatholytic agents are intolerable in effective dosage.

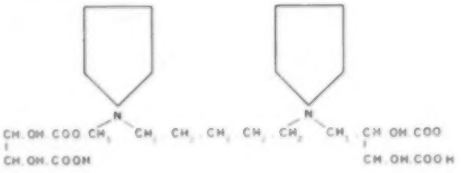
One of the side effects is partial or complete cycloplegia and that is how our interest in this study began. Numerous hypertensive patients were referred from the medical department because of visual disturbances. It soon became obvious that all these patients were treated with one of the newer ganglioplegics and their symptoms were related to a partial or complete loss of accommodation. The degree of cycloplegia varies with the dosage and type of drug. The subjective complaint of blurred vision depends also on the age of the patient. In addition we noted pupillary changes and recorded the intraocular pressure.

1. Ansolysen

This is the best known of the newer ganglionic blocking agents. It is a pentamethonium derivative (fig. 1) and is five times more active than hexamethonium in producing sympathetic blockade, but only one to two times more potent in producing a parasympathetic blocking effect.

The by-effects can all be accounted for on the basis of parasympathetic blockade. These include dry mouth, constipation, and impotence. Blurred vision has been mentioned but was never clearly analyzed.[9] Pilocarpine orally, reading glasses, and dark glasses were recommended.

The incidence of blurred vision in patients treated with oral Ansolysen has been reported as high as 52 percent.[8]



ANSOLYSEN

Fig. 1 (Blodi). The structural formula of Ansolysen.

In our series annoying cycloplegia occurred only rarely. It was, however, always present to some extent in patients below the age of 35 years when the dosage was higher than 100 mg. three times a day.

The influence of this drug on accommodation can best be seen on Figure 2. The onset was rather prompt, but the degree was never excessive. We did not have to order reading glasses. The low initial accommodation on these curves is the effect of medication from the previous evening.

We could never observe any effect on the pupil nor on the intraocular pressure.

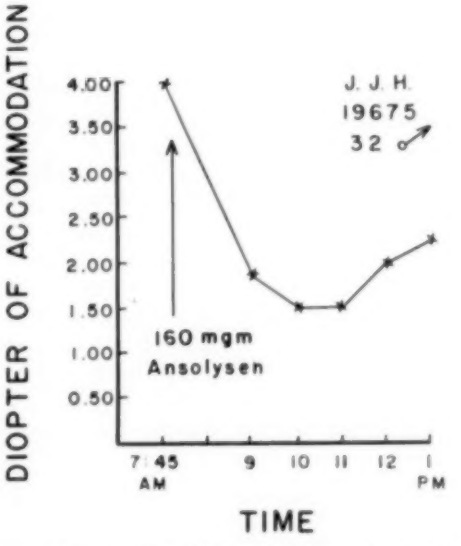


Fig. 2 (Blodi). The influence of 160 mg. Ansolysen on the accommodation of a 32-year-old man.

2. Ecolid

In order to improve the effects of medical sympathectomy this unsymmetrical compound was synthetized. In addition, the quarternary nitrogens are here separated by two rather than the usual five or six carbon atoms (fig. 3). The drug has two great advantages: it is well absorbed on oral medication and its effects last longer than the older ganglioplegics.

Blurred vision has again been described[6] as one of the complications and pilocarpine drops have been suggested as a remedy.

In our experience cycloplegia occurred frequently after Ecolid. It was only absent when the patient was older than 55 years and the dosage smaller than 20 mg. twice a day.

The paralysis of accommodation was here prompt and often nearly complete. Figure 4 is an example in a 37-year-old man. Its effect is dependent not only on the age of the patient and the dosage of the drug, but also on the absorption rate, that is, whether the drug was given before or after meals. In Figure 5 this difference can be appreciated. The loss of accommodation was complete when the drug was given early in the morning before breakfast. Half a diopter residual accommodation remained when the drug was given after breakfast.

Pupillary dilatation occurred when more than 30 mg. Ecolid was given. The pupils dilated up to four or five mm. and remained dilated for four or five hours. All pupillary reactions became extremely sluggish. The response of these pupils to miotics was inconsistent.

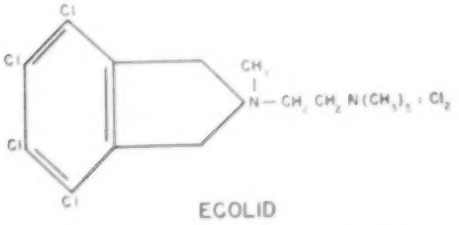


Fig. 3 (Blodi). The structural formula of Ecolid.

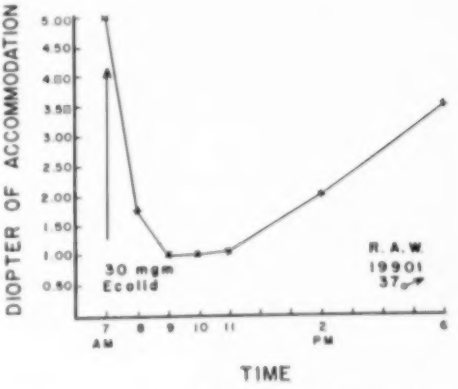


Fig. 4 (Blodi). The influence of 30 mg. Ecolid on the accommodation of a 37-year-old man.

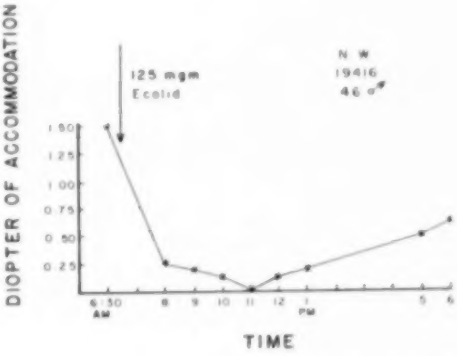


Fig. 5A (Blodi). The influence of 125 mg. Ecolid on the accommodation of a 46-year-old man. The drug was given before breakfast.

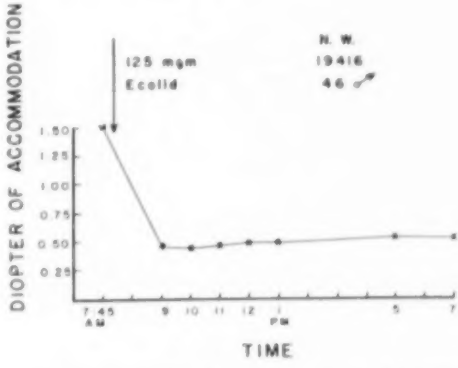
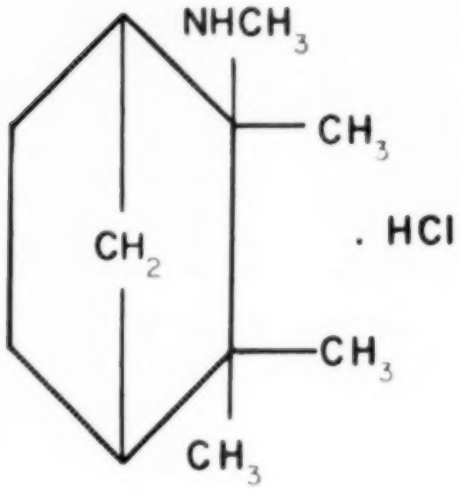


Fig. 5B (Blodi). The influence of the same dosage of Ecolid on the same patient when given after breakfast.



MECAMYLAMINE (INVERSINE)

Fig. 6 (Blodi). The structural formula of Mecamylamine.

No influence on the intraocular pressure was noted.

3. Mecamylamine (Iversine)

This is the newest type of the ganglionic blocking agents tested. It is not a quarternary ammonium at all, but a secondary amine (fig. 6). Its great advantage lies in its complete absorption after oral administration which ensures even results. It is long lasting (six to 36 hours) and reasonably specific.

Ocular complications have so far not been mentioned.[10] We found, however, partial cycloplegia and dilation of the pupil occasionally when the dose was five mg. or higher. A typical example is shown in Figure 7. This long-lasting agent did not allow a full recovery of accommodation during the night.

Discussion

The medical treatment of cardiovascular hypertension is becoming more and more effective and the ganglionic blocking agents play an important role in this armamentarium. Their continued use is of importance to the ophthalmologist. So far, all of these drugs have also a parasympathicolytic action and affect the ciliary ganglion. True sympatholytic agents are at the moment intolerable in effective dosage.

Many of these patients will therefore seek the advice of the ophthalmologist because of blurred vision. Familiarity with these drugs will help us to treat these patients and to reassure them.

Pilocarpine given internally has been advised to counteract these parasympathicolytic side-effects. In our experience this was of no value as far as accommodation is concerned. We had to prescribe reading glasses in a number of cases. But this is also not an ideal solution. The cycloplegia changes from hour to hour and while the glasses may be satisfactory at a certain time, they may be useless an hour earlier or later. It is sometimes necessary to switch from a

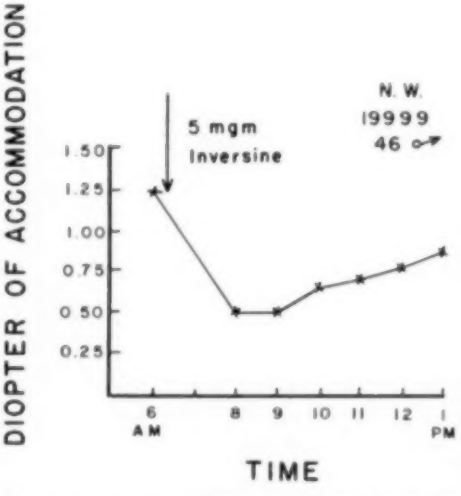


Fig. 7 (Blodi). The influence of five mg. Inversine on the accommodation of a 46-year-old man.

drug with a high cycloplegic effect to one with a low cycloplegic action.

On the other hand, we could speculate on the possibility that a drug could be found which given internally would cause a complete short lasting cycloplegia without much dilatation of the pupil. This could be of some help in refracting patients.

Summary

The newer ganglionic blocking agents which are used for the treatment of cardiovascular hypertension all have an effect on the ciliary ganglion. They cause partial or complete cycloplegia with occasional dilatation of the pupil. The experience with three such compounds (Ansolysen, Ecolid, and Mecamylamine) is described. Pilocarpine was of no help in counteracting the cycloplegia. Reading glasses are only an incomplete solution of the problem. It is often indicated to switch to a ganglioplegic with less cycloplegic effect.

University Hospitals.

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Ophthalmic Miniature

Rapidly increasing presbyopia

I speak seriously to her: "There is the commencement of a disease of much consequence, which is sometimes rapidly, sometimes slowly developed. Art can, however, prevent it, for this I can answer. I shall expect to see you again in a month. If redness or pain come on, come to me immediately, even if you are indisposed, for by neglect, but by neglect alone, irretrievable blindness might be the result. I shall give you a few lines for your medical attendant. Meanwhile you must spare your eyes. Reading I will not absolutely forbid, but use a large print, stop often, and immediately whenever you have any feeling of uneasiness." These words are the introduction to the proposal of iridectomy, which at the following visit she has to expect. Humanity urgently requires, that prejudice and ignorance should no longer oppose the use of iridectomy in glaucoma.

Donders, *Accommodation and Refraction of the Eyes*, 1864.

THE EFFECT OF TRANQUILIZING AND GANGLION-BLOCKING AGENTS*

ON THE EYES OF EXPERIMENTAL ANIMALS

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Philadelphia, Pennsylvania

The effects of tranquilizing and ganglion blocking agents on intraocular pressure were investigated. The agents studied were Chlorpromazine, Reserpine, Miltown, and Ansolysen.

HISTORICAL SURVEY

THORAZINE†

Bierent (Tunisia)[1] reported favorably on the use of Chlorpromazine in cases of acute glaucoma.

Nutt and Wilson[2] demonstrated extreme lowering of intraocular pressure in cataractous eyes after preoperative administration of Chlorpromazine.

Recently in the meeting of the Ophthalmological Society of France, Boudet, Montaigne, and Viallefont[17] reported on ocular hypotensive effect after the administration of Chlorpromazine in chronic simple glaucomas.

Paul and Leopold[15] noted a brief ocular hypotensive effect of Thorazine in experimental animals. The intramuscular dosage employed ranged from 25 mg. to 100 mg. and caused miosis in rabbits and mydriasis in cats.

RAU-SED‡

Rau-Sed, Squibb Reserpine, is an ester alkaloid derived from the Oleoresin fraction of the roots of any one of several species of plants of the genus rauwolfia.

Rau-Sed is a sedative and tranquilizing agent intended for use in the management of mental and emotional disturbance and has proven of value in a wide variety of disorders characterized by an emotional etiologic or exacerbating factor.

It has been reported that after administration of the drug there is ptosis in man,[3] ptosis and miosis in mice[4] and dogs.[6, 9]

MILTOWN§ *(2-methyl-2n-propyl-1, 3-propanediol dicarbamate)*

This drug has been successfully employed as a central nervous-system depressant and muscular relaxant. It is reported to be a satisfactory tranquilizing agent in anxiety or tension states.[5, 14]

ANSOLYSEN‖ *(Pentolinium tartarate)*

Ansolysen possesses high ganglion blocking activity[19] and has proved highly satisfactory for reduction of blood pressure in human beings. The cardiac, retinal, and coronary status of cases studied improved.[20]

Blurring of vision and paresis of accommodation have been reported after use of Ansolysen.[21]

EXPERIMENTAL STUDIES

1. THORAZINE

The present work was undertaken to evaluate (a) the effect of 1.0 mg. to 15 mg. dosage of Thorazine on the intraocular pressure and (b) to consider its mechanism for reducing the intraocular pressure.

A. The effect of administration of low dosages of Thorazine

Techniques. The rabbits were weighed, tagged, and wrapped in eye sheets. Pontocaine 0.5-percent solution was instilled in

* From the Wills Eye Hospital.

† Thorazine was supplied by courtesy of Smith, Kline & French, Philadelphia.

‡ Rau-Sed (Squibb Reserpine) was supplied by courtesy of Squibb.

§ Miltown supplied by courtesy of Wallace Laboratories.

‖ Pentolinium tartarate (Ansolysen) supplied by courtesy of Wyeth Laboratories.

the lower conjunctival cul-de-sac. Tonometry and tonography were performed. Pupillary size was estimated with calipers and a millimeter rule. Thorazine was administered by the intramuscular route.

1. *The effect of intramuscular injection of 1.0 mg. of Thorazine.* In this experiment 10 rabbits were employed. Within the first hour of the administration of Thorazine the average fall in intraocular pressure was 2.3 mm. Hg. The maximum average fall in intraocular pressure was 3.0 mm. Hg. The animals were observed for a period of six hours after the administration of the drug. It was observed that the maximum effect of the drug was produced between two to three hours of the administration. The effect on the eye, however, was short lived and the intraocular pressure returned to its original control value within six hours of administration. The pupillary size was unaffected.

2. *The effect of intramuscular injection of 5.0 mg. of Thorazine.* Ten rabbits were studied. Within the first hour of administration of the drug the average change in the intraocular pressure was a rise of 0.7 mm. Hg. However, the maximum lowering in the average intraocular pressure was recorded after three hours of administration of the drug and was 5.7 mm. Hg. This hypotensive effect did not last more than five hours and on longer observation the average tension reached the control value.

3. *The effect of intramuscular injection of 10 mg. of Thorazine.* Ten rabbits were investigated. Within the first hour of the administration of Thorazine the average lowering of intraocular pressure was of the order of 5.0 mm. Hg. The maximum lowering of intraocular pressure occurred between two to four hours of administration of Thorazine and ranged from 8.6 to 6.5 mm. Hg. All these animals were observed for six hours after the administration of the drug. At the end of that period the average decrease in the intraocular pressure was of the order of 2.2 mm. Hg. The average maximum change in the pupillary size was a reduction by 2.0 mm.

4. *The effect of intramuscular injection of 15 mg. of Thorazine.* Six rabbits were employed in this experiment. Within the first hour of administration of Thorazine the average lowering in intraocular pressure was 3.5 mm. Hg. The maximum decrease in intraocular pressure was recorded three hours after administration of Thorazine and was of the order of 9.0 mm. Hg. These six animals were observed for a period of six hours after the administration of Thorazine. At the end of that period the average decrease in intraocular pressure was 2.5 mm. Hg. The maximum hypotensive effect of the drug was recorded two to four hours after the administration of the drug. The average decrease in pupillary size was 2.5 mm. (figs. 1 and 2).

B. The effect on the bicarbonate ion concentration of the aqueous humor

In this experimental investigation 12 unanesthetized average weight (2.5 kg.) rabbits were employed

As a control, bicarbonate ion estimations

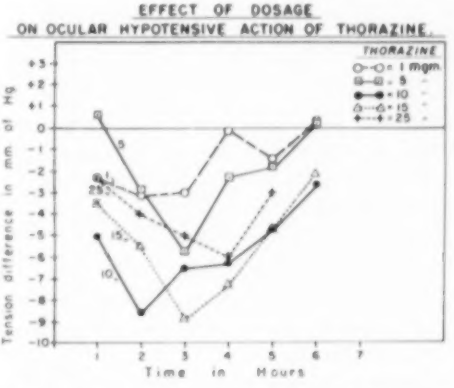

Fig. 1 (Paul and Leopold). Effect of dosage on ocular hypotensive action of Thorazine in rabbits. Dosages varying from 1.0 mg. to 25 mg. were given intramuscularly. Intraocular pressure measured with a Schiøtz tonometer (5.5 gm). Dosages of 5.0, 10, 15 mg. of Thorazine were given to 10 rabbits each while 1.0 mg. and 25 mg. were each given to six rabbits.

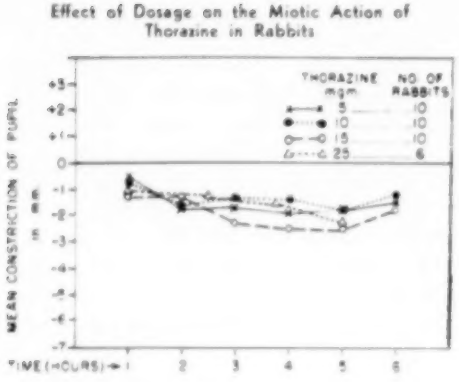

Fig. 2 (Paul and Leopold). Effect of dosage on the miotic action of Thorazine in rabbits. Thorazine was given intramuscularly. The dosage varied from 10 mg. to 25 mg. The size of the pupil was measured with calipers and a millimeter rule.

were done on the arterial blood (ear artery) and the aqueous humor from the posterior and anterior chambers of one eye of each rabbit prior to any therapy.

Chlorpromazine (75 mg.) was given to each rabbit eye by the intramuscular route.

Two hours after the administration of Thorazine the maximum hypotensive effect was evident and the posterior and anterior chambers of one eye of each rabbit were tapped. Samples of arterial blood (ear artery) were also taken for evaluation. Bicarbonate ion concentration as compared with that of the other eye and the arterial blood (ear artery) taken at 0 minutes indicated that there was no appreciable effect after treatment with Thorazine.

2. Rau-Sed (Squibb Reserpine)

Experimental studies on the ocular effects of Reserpine were conducted on rabbits. The same technique as mentioned before was employed to evaluate the effects of the drug on the intraocular pressure, the pupillary size, and lid function.

Five mg. of the drug were administered by the intramuscular route. The rabbits were divided into three groups: (A) Those that received the injection the same day; (B) those that received daily injections of 5.0 mg. of Rau-Sed for three days; (C) those that received daily injections of Rau-Sed for seven days.

A. *This group included six animals.* These animals were observed up to six hours after the administration of the drug.

There was no significant change in the intraocular pressure as evaluated by Schiøtz tonometer. Almost all the animals showed miosis. The miosis was maximum two and one-half to four hours after the injection of the drug (fig. 3).

Drooping of the upper lid was noticeable in all animals.

B. *Six animals comprised this group.* Evaluation of the intraocular pressure was done every day and failed to show any change. The pupils were extremely miotic but reacted to light. All animals showed extreme drooping of the upper lid.

C. *Six rabbits were used in this series.* Intraocular pressure was evaluated every day and did not change.

The animals were extremely tranquilized.

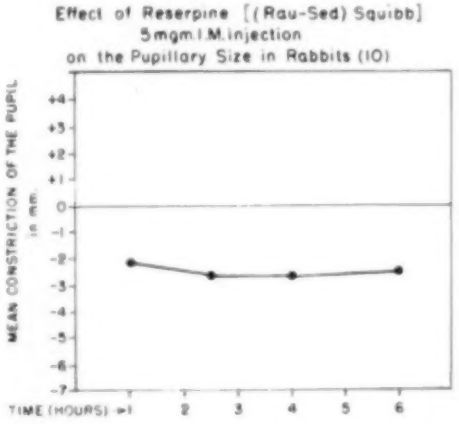

Fig. 3 (Paul and Leopold). Effect of Reserpine (Rau-Sed) Squibb on the pupillary size. Reserpine (5.0 mg.) was given by the intramuscular route. Pupillary size was estimated by calipers and a mm. rule.

Footnote: These studies were conducted by Dr. Harry Green and staff. Unpublished results.[18]

The miosis in all six was extreme but the pupils reacted to light. Ptosis in all rabbits was quite evident.

3. MILTOWN *(2-methyl-2-n-propyl-1, 3-propanediol dicarbamate)*

The same technique as mentioned before was employed to evaluate the effect of the drug on the intraocular pressure, the behavior of the pupil, and any other outstanding ocular effects.

Miltown was administered by the intramuscular route. Experimental investigations were carried out on two groups of rabbits: (A) Those that received a 200-mg. intramuscular injection of Miltown; (B) those that received a 400-mg. intramuscular injection of Miltown.

A. *In this group 10 rabbits were employed.* All these animals were observed up to five hours after administration of Miltown. There was no significant change in the intraocular pressure. The pupil showed a slight tendency toward mydriasis and the animals were slightly tranquilized.

B. *Twenty-one rabbits were in this group.* All these animals were observed up to five hours after administration of Miltown. During the first hour of administration the average fall in intraocular pressure was of the order of 4.7 mm. Hg. The average maximum hypotensive effect of the drug was recorded between two to four hours after administration and was 8.6 mm. Hg (figs. 4 and 5).

Five hours after injection of Miltown the average fall in intraocular pressure was 4.3 mm. Hg.

All rabbits had a tendency toward mydriasis. Within the first hour of administration of Miltown average increase in pupillary size was 1.4 mm. The average maximum increase in pupillary size was recorded two to four hours after administration of the drug and was 2.0 mm.

With the administration of 400 mg. of Miltown the animals were extremely tranquilized. The drug did not prove to be fatal in the doses administered in this experimental study.

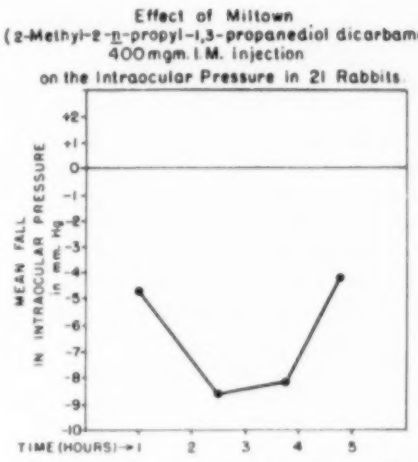

Fig. 4 (Paul and Leopold). Effect of Miltown on the intraocular pressure in 21 rabbits. Miltown (400 mg.) was given intramuscularly. Intraocular pressure was measured by a Schiötz tonometer (5.5 gm.).

4. PENTOLINIUM TARTARATE (ANSOLYSEN)

The same techniques as mentioned before were used to evaluate the effect of the drug.

Ansolysen was administered by the intramuscular route. Experimental investigations

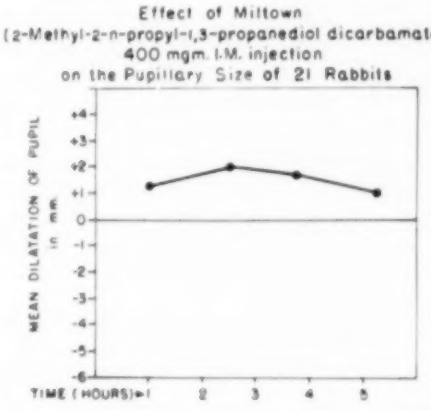

Fig. 5 (Paul and Leopold). Effect of Miltown on the pupillary size in 21 rabbits. Miltown (400 mg.) was given by the intramuscular route. Pupillary size was measured with calipers and a millimeter rule.

were carried out in three groups of rabbits: (A) Those that received 2.5 mg. of Ansolysen; (B) those that received 10 mg. of Ansolysen; (C) those that received 20 mg. of Ansolysen.

Each dose was studied in five rabbits averaging 2.5 kg. in weight. All animals were observed up to a period of four hours after administration of Ansolysen.

No change in the intraocular pressure was recorded after the 2.5 mg. dosage. The pupil was slightly mydriatric but reacted to light.

Within the first hour after administration of 10 mg. of Ansolysen the fall in intraocular pressure averaged 6.0 mm. Hg.

All of these animals were observed up to a period of four hours after administration of the drug. The maximum hypotensive effect of the drug was recorded between one to three hours after administration and averaged 8.0 to 9.0 mm. Hg.

At the end of three hours after administration the intraocular pressure had a tendency to rise toward the original value.

The pupillary size in all cases had increased and the maximum mydriasis recorded averaged 2.5 mm. The pupil was sluggish to light (figs. 6 and 7).

Within one hour after the administration of 20 mg. of the drug the fall in intraocular pressure averaged 10 mm. Hg. All animals were observed up to a period of four hours after the administration of the drug. The maximum hypotensive effect of the drug was recorded one to three hours after the administration of the drug. At the end of four hours of observation it was noted that in all cases the intraocular pressure showed a marked tendency to return to the initial level.

The pupil was mydriatic in all cases and was sluggish in reaction to light. The increase in pupillary size average 3.0 mm. (figs. 8 and 9).

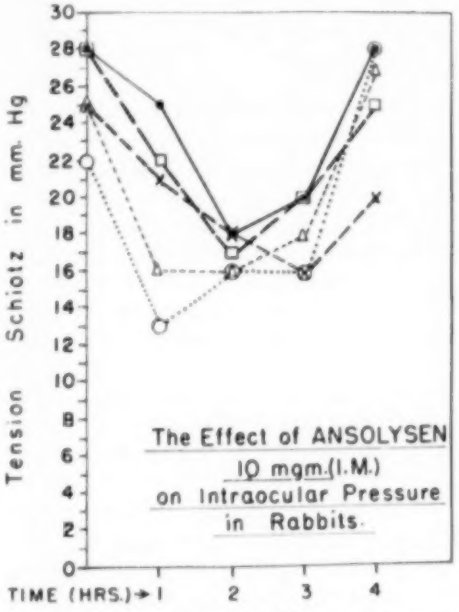

Fig. 6 (Paul and Leopold) Effect of Ansolysen on the intraocular pressure in five rabbits. Ansolysen (10 mg.) was given by the intramuscular route. Intraocular pressure measured with a Schiötz tonometer (5.5 gm.).

Discussion

1. Thorazine

In these studies 5.0 to 15 mg. doses lowered intraocular pressure. Thorazine in 1.0 to 5.0 mg./2.5 kg. rabbits failed to lower intraocular pressure. Doses above 5.0 mg. usually produced a hypotensive action. This result paralleled those of earlier studies which employed larger doses, for example 25 to 100 mg.[15]

The site of action of this ocular hypotensive agent has not been established.

The change in the pupil size could not be responsible for the ocular-tension lowering action of Thorazine, as in one species (rabbits) it acts as a miotic, while in cats, mydriasis ocurs.

Biochemical studies failed to show any change in the bicarbonate-ion concentration in the posterior or anterior chamber of rabbit eyes at the time of the maximal hypotensive action of the drug. Bicarbonate ion transfer appears to be undisturbed by Thorazine administration.

Tonographic studies were performed and were not conclusive.[15] A dosage of 50 mg. induced a slight rise in the coefficient of

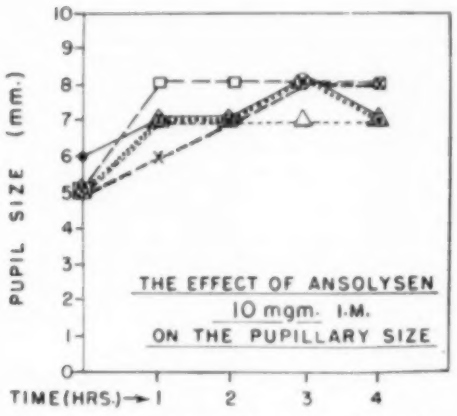

Fig. 7 (Paul and Leopold). Effect of Ansolysen on the pupillary size in five rabbits. Ansolysen (10 mg.) was given by the intramuscular route. Pupillary size estimated by a mm. rule and calipers.

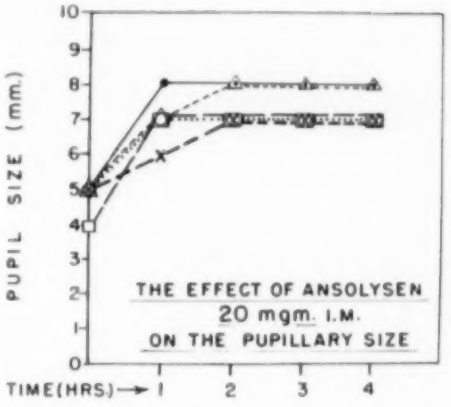

Fig. 9 (Paul and Leopold). Effect of Ansolysen on the pupillary size in five rabbits. Ansolysen (20 mg.) was given by the intramuscular route. Pupillary size estimated by calipers and mm. rule.

aqueous outflow and 75 mg. a slight fall in the coefficient. Both doses produce a drop in intraocular pressure so the ocular tension effect does not appear to be based on the influence on the outflow resistance.

This drug has many other possible actions. It lowers blood pressure and through this mechanism the intraocular pressure could be decreased. It might alter the volume of blood in the vascular coats of the eye or produce its ocular effect by some central action.

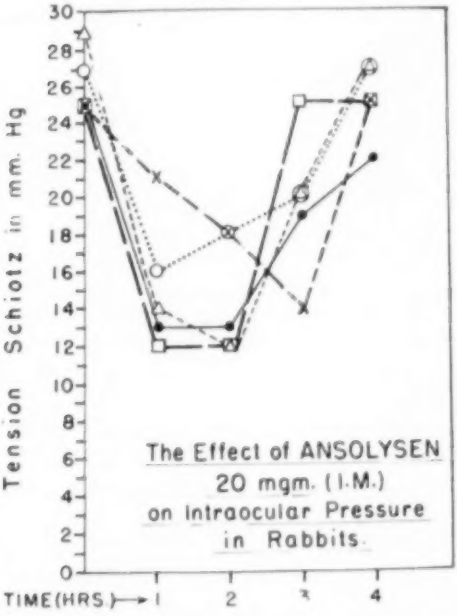

Fig. 8 (Paul and Leopold). Effect of Ansolysen on the intraocular pressure in five rabbits. Ansolysen (20 mg.) was given by the intramuscular route. Intraocular pressure estimated by a Schiøtz tonometer (5.5 gm.).

2. Reserpine

The production of miosis, ptosis, and a general state of lethargy similar to sleep can be postulated to be due to the depressant effect of Reserpine on the hypothalamus[10] and its descending pathways.

Experimental and clinical lesions in these hypothalamic nuclei have been shown to be associated with a decrease in metabolism, body temperature, and heart rate, with Horner's syndrome and with a general state of lethargy.[11] These effects remarkably parallel effects associated with Reserpine therapy. This agent did not bring about a reduction in intraocular pressure.

3. Miltown *(2-methyl-2-n-propyl-1, 3-propanediol dicarbamate)*

The experimental results after Miltown therapy indicate extreme tranquilization of the animal and lowering of intraocular pressure. Pharmacologic studies[12-13] indicate that

Miltown produces muscular relaxation and is a central nervous system depressant.[14] The ocular hypotensive effect of Miltown may be the result of the action on the higher centers and muscular relaxation.

4. Ansolysen

It is possible that the ocular hypotensive effect and paresis of accommodation are due to the ganglionic blocking properties of the drug.[19]

Conclusion

1. Thorazine

1. Intramuscular administration of Thorazine lowered intraocular pressure.

2. Thorazine did not alter the bicarbonate-ion concentration in the posterior and anterior chambers of the eye.

3. Thorazine did not affect the resistance to aqueous outflow in consistent fashion.

2. Rau-Sed

1. The drug does not affect the intraocular pressure after continuous therapy for a week.

2. It causes miosis and ptosis in rabbits as well as lethargy.

3. Miltown

1. Doses below 400 mg. per rabbit did not affect the intraocular pressure.

2. Doses of 400 mg. caused lowering of intraocular pressure in rabbits.

3. The maximum effect of the drug occurred two to four hours after administration.

4. Miltown caused dilatation of the pupil in rabbits.

5. The animals were extremely tranquilized.

4. Ansolysen

1. When 2.5 mg. were given to an average weight (5.0 lb.) rabbit, there was no effect on the eyes.

2. In doses of 10 and 20 mg. per rabbit it lowered the intraocular pressure.

3. Lowering in intraocular pressure was not persistent.

4. The drug caused mydriasis and paresis of accommodation.

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EFFECT OF STEROIDS ON TENSILE STRENGTH OF CORNEAL WOUNDS*

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INTRODUCTION

Cortisone has proven to be a useful adjunct in the treatment of certain inflammatory eye diseases.[1] However, this drug was initially not fully exploited in inflammatory processes following surgery because of early reports in the literature describing the inhibition of wound healing by cortisone.[2-6] The majority of these reports were based on histologic studies,[2-4,6] and conclusions as to tensile strength were merely inferred.

In a recent article, Palmerton[7] reported that cortisone has an inhibitory effect on corneal wound healing. He made use of a technique whereby he measured directly the tensile strength of the wound. This technique was similar in many respects to one which we employed in measuring the effect of cortisone on corneal wound healing. The study which was carried out in 1952-53 and presented to the Eastern Section of the Association for Research in Ophthalmology in February, 1954, demonstrated no such inhibitory effect by cortisone. The difference in conclusions might be attributed to certain fundamental variances in technique:

a. No mention was made by Palmerton of the use of anticoagulants for the prevention of clotting of the rabbit aqueous by the fibrinogen contained therein. A fibrin would have a tendency to become interposed between the lips of the wound and thus prevent consistent cornea-to-cornea wound approximation. More pronounced variability could thus be expected.

b. The length of the corneal wound employed by Palmerton was five mm. We had tried a wound of this size and discarded it as unsatisfactory. It was our experience that a seven-mm. corneal incision afforded us a more accurate bursting point.

c. Our traction sutures were placed at the time of surgery, while Palmerton placed his at the time of testing. We felt that trauma to the cornea and distortion of the wound edges would occur if traction sutures were placed just prior to measuring the bursting point of the wound. One cannot adequately estimate to what extent this added manipulation has impaired the solidity and therefore the tensile strength of the wound. Another factor of variability has thus been introduced.

d. We would like to point out that there

* From the Department of Surgery (Ophthalmology) of the Cornell University Medical College. Presented before the Eastern Section of the Association for Research in Ophthalmology, February, 1954, Philadelphia, Pennsylvania.

was a considerable difference in the method of administration of the cortisone. Palmerton mentions the use of both topical and subconjunctival cortisone, whereas we employed the intramuscular route. We make no attempt to correlate differences as a result of this particular variation but wish to mention that it existed.

We feel that these differences have enabled us to obtain a more accurate evaluation of the tensile strength of the wound. Our additional clinical experience in recent years with cortisone in patients following cataract extraction and corneal grafting supports the conclusions drawn in our paper. We therefore feel that reporting of our thus far unpublished work may be of value in shedding further light on this controversial question.

Method

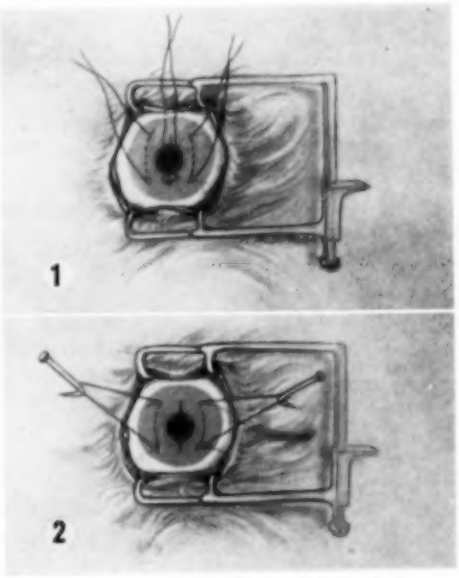
Technique

A corneal incision of specified length was made. The wound edges were then pulled apart after a certain number of days. The quantity of force found necessary to accomplish this disruption was then used as a measure of the tensile strength of the wound.

A seven-mm. linear scratch was made in the center of the cornea to outline the position of the corneal incision. Two intracorneal sutures were then placed four mm. on either side of the scratch. They ran through the cornea for a distance of approximately five mm. and were tied with a short loop. These loops were to be used later as points of fixation for disrupting the corneal wound.

A Stallard-type suture, three mm. in length, was placed so as to straddle the center of the corneal scratch. The loop of this center suture was then pulled aside, and a seven-mm. incision was made with a Wheeler knife at the site of the previous corneal scratch (fig. 1).

The anterior chamber was then irrigated with 2.5-percent sodium citrate in order to prevent clotting action by the fibrinogen contained in the rabbit aqueous. If this were not done, a fibrin clot might become interposed between the lips of the wound and thus prevent adequate approximation.



Figs. 1 and 2 (Fink and Baras). The surgical technique.

The Stallard-type suture was then pulled taut and tied to re-approximate the wound edges (fig. 2). Atropine sulfate (50 percent) was then instilled in the eye followed by penicillin ointment (500 µg.). The lids were then sutured together.

After a specified period of time, varying from three days to a week, the wounds were disrupted. This was accomplished by attaching a tiny hook to each of the preplaced intracorneal loop sutures. The Stallard suture was then cut. The hooks were then attached to strings which ran over pulleys and were in turn connected to a weighting pan. BB shot was then slowly added to the weighing pan until the wound edges separated and aqueous was lost (fig. 3). The pan and BB shot were then weighed and this figure was recorded as a measure of the tensile strength of the wound.

The rabbits were divided into two groups. One group received daily subcutaneous injections of cortisone (15 mg./kg. of body

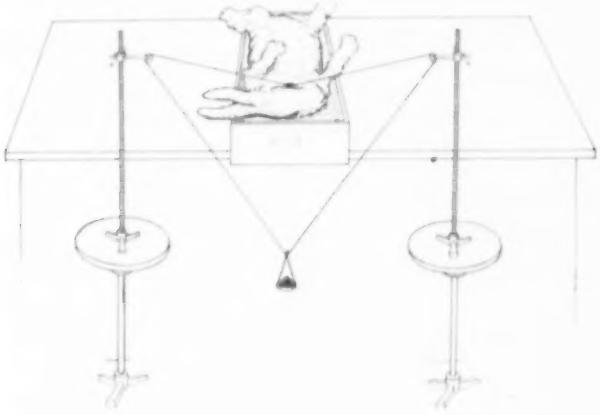


Fig. 3 (Fink and Baras). Technique of wound disruption.

weight). This dosage had been used previously by Maumenee[8] in investigating the role of cortisone in corneal graft sensitization. Cortisone was administered immediately following surgery and continued until the wound was disrupted. The second group received nothing.

Observations

Included in this study are observations made on 71 rabbit eyes. Many more eyes had been operated upon but could not be used for the following reasons:

a. *Intraocular infections.* This complication was found more often in rabbits receiving cortisone and occurred in approximately one out of four rabbits.

b. *Sloughing of sutures.* It was, as previously mentioned, necessary to place all sutures intracorneally, in order to preserve the anterior chamber and prevent premature clotting of the aqueous. The rabbit cornea is extremely thin. This made it difficult to place the sutures intracorneally and at the same time deep enough to prevent sloughing.

c. *Poor approximation of the wound edges.* The eyes were inspected grossly and all those with poorly approximated wound edges were discarded.

The principal observation of this study was that cortisone had no significant influence on the tensile strength of corneal wounds in rabbits. The animals were divided into three separate groups; those with wounds which were disrupted on the fourth, the fifth, and the seventh day following surgery. It is noted that the tensile strength of the wounds gradually increased from the fourth to the seventh day (table 1).

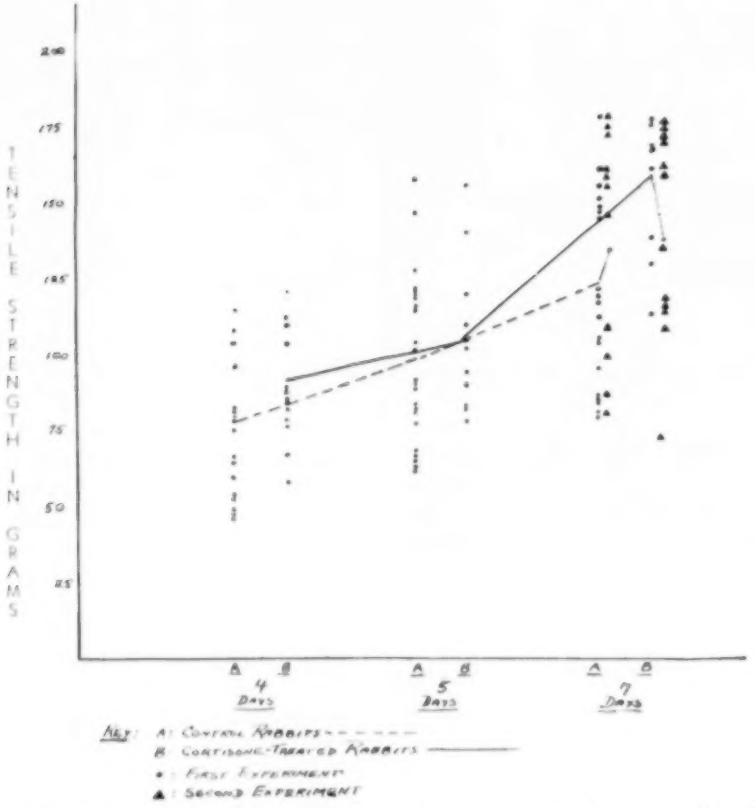
In the first series of experiments, as demonstrated by Table 4, the average tensile strength of the wounds in the cortisone treated rabbits exceeded that of the untreated animals. However, the technique of

TABLE 1

Cortisone and corneal wound healing: summary of first experiment

	Four Days		*Five Days*		*Seven Days*	
	A	B	A	B	A	B
Number of Eyes	10	10	18	8	10	4
Average Tensile Strength	77 gm.	93 gm.	98 gm.	105 gm.	121 gm.	160 gm.
Standard Deviation	22	11	25	19	29	13
"t"	1.49		0.64		2.49	
Conclusion	Not significant		Not significant		Nearly significant	

KEY: A: Control rabbits; B: cortisone-treated rabbits.



Graph I (Fink and Baras). Observations in studies on cortisone and corneal wound healing.

the experiment gave rise to a considerable experimental variation as evidenced by the large standard deviation.

The figures were then submitted to further statistical analysis in order to determine whether the difference between the two groups was actually significant or lay within the limits of experimental error. The "t" test was used as the criterion (the letter "t" represents the ratio between the difference of the treated and untreated groups and the standard error of the difference).

The four- and five-day series were then found to be not significant. The seven-day group was found to approach statistical significance. A second series of seven-day studies was therefore undertaken. The reasons for further study were twofold: (a) The cortisone-treated group in the first series was small; (b) we wished to introduce further statistical controls.

This included pairing of the treated and untreated animals, with recording of weight and sex. The results in this series were then analyzed, utilizing the "t" test and the difference between the treated and untreated group was found not significant (table 2).

Discussion

The observations of this study have led us to assume that the use of cortisone does not materially affect the tensile strength of corneal wounds in rabbits. This statement would seem to be in direct variance with many previously published reports dealing with cortisone and wound healing. Ragan[10]

TABLE 2

CORTISONE AND CORNEAL WOUND HEALING: SUMMARY OF SECOND EXPERIMENT

	Control Rabbits	Cortisone-Treated Rabbits
Number of Animals	6	6
Average Tensile Strength	137 gm.	141 gm.
Standard Deviation	26	31
"t" test	0.38	
Conclusion	Not significant	

was first to demonstrate the inhibition of wound healing by cortisone. Many papers, dealing with this subject, have been published since that time. Most have agreed with Ragan's conclusion[5,6,11] while others have found the steroids to be without effect in wound healing.[12-15]

Investigations on animals have fallen into two groups; histologic studies and experiments in which the criterion was the mechanical bursting strength of the wound. The majority of investigators seem to agree that there is a general supression of fibroblastic proliferation in cortisone-treated animals. There have been a number of other studies in which the steroids exhibited little or no effect on wound healing.

Bangham[8] found that cortisone had no effect on guinea pigs but did cause retardation in rabbits. He attributed this to a species difference. This might also account for the lack of response, reported by Ragan[10] in cortisone-treated rats. Findlay and Homes[12] found cortisone to have no effect on wound healing in rabbits placed on a normal diet. Those with protein depletion, due to weight loss, showed retardation in healing when placed on cortisone.

Ashton[16] found no inhibition with this steroid when therapeutic doses were given. In larger doses there was a delay in healing. Cole and Orbison,[17] experimenting with dogs, found that sutured wounds healing per primam were not affected by cortisone. They point out that wound healing per primam requires less capillary proliferation and fibroblastic response than those healing by secondary intention. Grant[14] and Gonzalez[15] working on experimental tendon repair in rabbits found no inhibition with cortisone.

There has accumulated a small number of reports showing cortisone to have no effect on wound healing in man. Greene and coworkers[13] reported normal healing in cortisone-treated patients upon whom splenectomies were performed. Kay and Odell[18] cite three cortisone-treated arthritics upon whom reconstructive foot operations were performed without any impairment of healing. Daily and Daily[19] feel that the topical use of cortisone in corneal transplantation, both at the time of surgery and postoperatively, reduces the hazard of operation.

Certain of the above studies deserve added comment in relation to our own observations and technique. It was our purpose to have these wounds heal by primary intention thus paralleling Cole's observations on dogs. Maintaining our rabbits on a normal diet without protein loss might have prevented a deleterious influence by cortisone.

It is not the purpose of this paper to dispute the well-substantiated histologic evidence demonstrating the inhibition of fibroblastic proliferation in the cornea with the use of cortisone.[2,16,20] However, from a review of our observations, it would not be unreasonable to assume that there is little or no relationship between the histologic picture in a corneal wound and the actual tensile strength of that wound.

CONCLUSION

Under the conditions of this experiment and in the animals tested it is our belief that cortisone seems to exert no significant effect on the tensile strength of experimentally induced corneal wounds in rabbits.

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THE EFFECTS OF HYPOXIA AND HYPEROXIA*

Upon the oxygen tension in the vitreous humor of the cat

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Introduction

It is obvious that oxygen is necessary for the maintenance of retinal life. The mechanisms by which oxygen is transported to and metabolized by the retina, however, are not so well known. The diffusion of oxygen through the vitreous humor is one factor in retinal metabolism. It has been found that, under normal conditions, the oxygen tension in the anterior chamber of the eye is 40 to 50 mm. Hg, while that in the posterior chamber is 100 to 120 mm. Hg.[1] The purpose of the present study was to determine the relationships between the oxygen tension in the vitreous humor of the adult cat and the environmental conditions of hypoxia and hyperoxia.

* From the Division of Ophthalmology, Department of Surgery, of The University of Chicago. This investigation was supported by the Douglas Smith Foundation for Medical Research and the Chicago Community Trust of Chicago. Presented at the Midwest Section of the Association for Research in Ophthalmology, March 17, 1956, at Chicago.

The determination of oxygen tensions in the inner cavities of the eye is pertinent to the better understanding of the relationships between oxygen tensions in the environmental atmosphere and disease processes of the eye. Perhaps the most dramatic ocular disease caused by excess oxygen administration is retrolental fibroplasia.

Patz[2] concluded that the eye is susceptible to this damage only when the retina is incompletely vascularized. This, of course, explains the high incidence of retrolental fibroplasia in premature infants who are administered large quantities of oxygen for prolonged periods of time.

Since the vitreous humor derives much of its oxygen by diffusion from the retinal vessels, the oxygen tension in the vitreous humor is of interest in the study of this disease process. Although retrolental fibroplasia is not incurred by the adult, it is of equal interest to know how much oxygen is present in the vitreous humor of the fully vascularized eye under conditions of hypoxia and hyperoxia.

Method

The polarographic method, similar to that used by Davies and Brink[3] and Montgomery and Horwitz,[4] was utilized for measuring the oxygen tension in the vitreous humor of the cat under conditions of hypoxia and hyperoxia.

Platinum electrodes were used because, in this type of circuit, platinum is capable of reducing the oxygen in the tissue being studied, thereby creating a current which can be measured with a galvanometer. The galvanometer serves as an ammeter whose deflections are directly proportional to the oxygen tension in the tissue or solution being studied.

The electrodes were prepared of soda-lime glass tubing having a 3.0-mm. O.D. and a 1.5-mm. I.D., a 2.0-cm. strip of platinum wire having a diameter of 0.02 to 0.03 mm., and mercury. A recessed electrode was not used in this experiment because of the increased recovery time necessary when using such an electrode; an open type of electrode was not used because only relative values could be obtained with it. This is in agreement with the results obtained by Davies and Brink.[3] Consequently, 1.0 mm. of platinum wire was allowed to project beyond the edge of the glass tubing. Such an electrode was found to be the most favorable for this experiment.

A 5.5 to 6.5 cm. column of mercury was placed in the open end of the glass tubing. No. 18 insulated copper wire was inserted into the mercury, and the completed electrode was stored in a solution of 0.9-percent sodium chloride. The electrodes were removed from this solution only when in use. The saline was renewed every 48 hours.

The electrical circuit is illustrated in Figure 1. The main switch (E) was kept closed throughout all determinations and the zero adjustment of the string galvanometer was controlled by the 500-ohm variable resistance (H). The sensitivity of the galvanometer was 2.5×10^{-8} amperes. Throughout all experiments the voltage was kept at

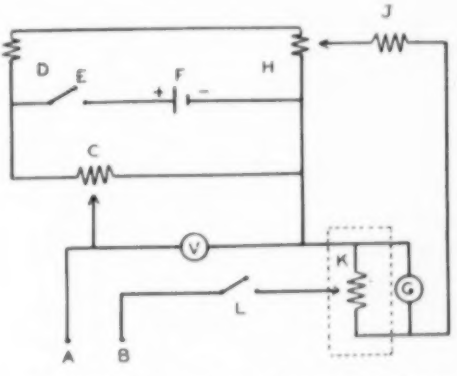

Fig. 1 (Krause and Goren). Diagram of electric circuit. (A) Calomel half-cell containing 0.9-percent NaCl (anode). (B) Tissue electrode (cathode). (C) Variable resistance of 10,000 ohms. (D) Fixed resistance of 40,000 ohms. (E) Main switch. (F) 1.5-volt dry cell. (G) Galvanometer (Rubicon No. 3418). (H) Variable resistance of 500 ohms. (J) Fixed resistance of 2,000,000 ohms. (K) Aryton shunt (Rubicon No. 1243). (L) Electrode switch. (V) Voltmeter.

0.7 V. Higher voltages did not give an appreciable deflection of the galvanometer, while lower voltages decreased the accuracy and the sensitivity of the galvanometer because of the increased current flow.

The electrodes were calibrated by measuring the current created by the reduction of oxygen in standard saline solutions of known oxygen tension and temperature. They were calibrated with 0.9-percent solution of sodium chloride equilibrated with 20.9-percent oxygen and then with the same solution equilibrated with 100-percent oxygen at constant temperatures. In order to equilibrate 0.9-percent solution of sodium chloride with 100-percent oxygen, pure oxygen was bubbled into the solution for 45 minutes before readings were taken and discontinued thereafter for only 20 seconds of each minute (that is, 10 seconds before the switch was closed and 10 seconds necessary for the determination of a reading). Experimental data revealed that the saline solution was equilibrated with the desired oxygen tension after 45 minutes (not tabled). The bubbling was stopped 10 seconds prior to closing the switch so as to allow the solution to stop swirling. This precaution was taken because agitation of the solution produced increased and inconstant deflections of the galvanometer as a result of convection currents increasing the rate of oxygen supply to the electrode. In accordance with the work of Montgomery and Horwitz,[4] it was found that errors caused by excessive reduction of oxygen by prolonged current flow and from the period swing of the galvanometer were avoided by reading the galvanometer 10 seconds after closing the electrode switch.

For calibration, the electrodes were dipped into a 150-ml. beaker which contained 100 ml. of 0.9-percent sodium chloride solution. The calomel half-cell was placed in the same beaker as the electrode, thereby completing the circuit. Care was taken so that no air bubbles were trapped in the calomel half-cell. Determinations were made at 110-second intervals to allow sufficient time for the electrode to recover from its previous use. All readings were recorded 10 seconds after the electrode switch was closed.

Multiple determinations were made with 0.9-percent solution of sodium chloride at 14°C., 24°C., 34°C., and 37°C. equilibrated with 20.9-percent and 100-percent oxygen respectively as shown in Figure 2. Increased temperatures up to 60°C. resulted in increased galvanometric deflections because of the greater diffusibility of oxygen at higher temperatures. From 60°C. to 85°C., however, the readings decreased as a result of the increased temperature agitating the molecules of oxygen to a point where they were forced out of solution (not tabled).

Cats weighing approximately four kg. were anesthetized with an intraperitoneal inoculation of Nembutal-Sodium.[8] They were then placed in an Isolette incubator and the desired oxygen tension was maintained for 45 minutes. After 45 minutes, the oxygen tension in the vitreous humor had reached a plateau. It was therefore assumed that the oxygen tension in the tissue being studied was at equilibrium with the oxygen tension in the environmental atmosphere.

A Beckman oxygen analyzer, Model D, was used to measure the oxygen tension in the circulating air in the incubator. Blood on the tip of the electrode caused inaccurate

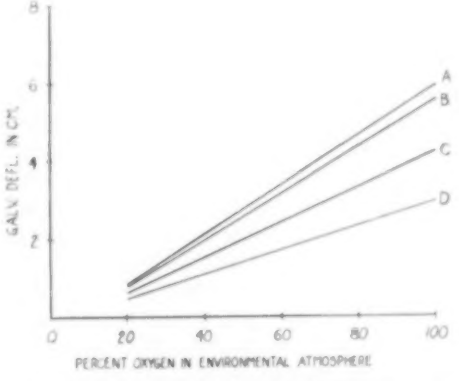

Fig. 2 (Krause and Goren). Temperature correction curves. (A) 37°C. (B) 34°C. (C) 24°C. (D) 14°C.

and variable results because the small surface to volume ratio of a droplet of blood prohibited it from giving off oxygen as easily as the tissue cells could. Therefore, bloodless surgery was performed.

The cornea was removed and the aqueous humor allowed to drain. Forceps were used to retract the lens, and the electrode was inserted into the vitreous humor. Absorbent cotton soaked in 0.9-percent saline was used to make contact between the eye and the calomel half-cell, thereby completing the electrical circuit. Temperature corrections were extrapolated from the experimental data shown in Figure 2.

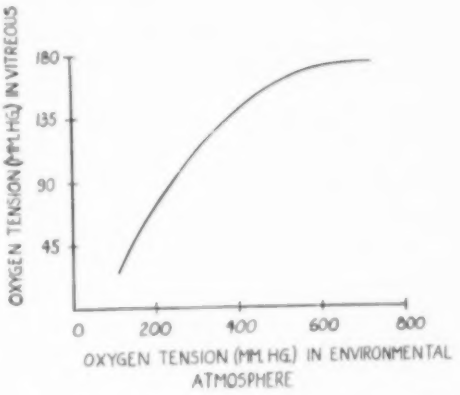

Fig. 3 (Krause and Goren). The exponential curve expressing the relationship between the oxygen tension in the vitreous humor and that in the environmental atmosphere.

Results

The oxygen tension in the vitreous humor of the cat under conditions of hypoxia and hyperoxia are tabulated in Table 1 and graphed in Figure 3. The ideal equation of the curve was found to have an exponential form. Under normal physiologic conditions, the average oxygen tension in the vitreous humor was 53 mm. Hg. When the animal was submitted to moderate hypoxia, such as 15-percent oxygen in the inspired air, the average oxygen tension in the vitreous humor was 28 mm. Hg. The maximum oxygen tension attained in the tissue being studied was 172 to 177 mm. Hg. Oxygen tensions in the environmental atmosphere above 610 mm. Hg failed to cause any significant increase in the oxygen tension in the vitreous humor.

Another series of experiments were performed in which cats were first placed in an

TABLE 1

OXYGEN TENSION IN VITREOUS OF CAT

Oxygen Tension (mm. Hg) in Environmental Atmosphere	114	154	304	455	609*	680	745
Oxygen Tension (mm. Hg) in Vitreous Humor*	30	53	115	100	162	175	178
	26	53	122	133	160	177	180
	29	53	118	121	190	176	175
	29	52	99	144	162	176	179
	31	47	121	129	175	173	172
	27	53	115	144	182	174	180
	28	51	118	121	174	178	178
	27	53	112	133	181	176	177
		53	115	136	160	177	178
		72	118	141	170	174	176
		47	136	133			
		57	115	130			
		54	115				
		53	101				
		53	115				
		53	110				
		53	118				
		61	118				
		53					
		62					

* Temperature corrections have been made for the tabulated data.

TABLE 2

RELATIONSHIPS BETWEEN OXYGEN TENSION AND TIME IN OXYGEN

Minutes out of Incubator	0	2	4	6	8	10	12	14
Oxygen Tension (mm. Hg) in Vitreous Humor*	100	88	70	62	55	51	53	52
	133	90	72	58	53	55	53	54
	121	86	63	59	52	53	53	54
	144	87	74	61	51	53	58	50
	129	89	70	60	58	50	49	53
	144	88	71	60	57	54	54	52
	121	85	69	63	56	53	53	53
	133	90	70	61	55	53	53	53
	136	91	71	60	57	54	54	52
	141	87	73	62	55	52	53	53
	133							
	130							

* Temperature corrections have been made for the tabulated data.

incubator and 60-percent oxygen administered to them for 45 minutes. The animals were then removed from the incubator, placed in 20.9-percent oxygen, and the oxygen tension in the vitreous humor determined at various intervals. The results are tabulated in Table 2 and graphed in Figure 4. The ideal equation of this curve was also found to have an exponential form. The oxygen tension in the vitreous humor sharply decreased initially, and then levelled off at 53 mm. Hg after the animal had been removed from the incubator for eight to 10 minutes.

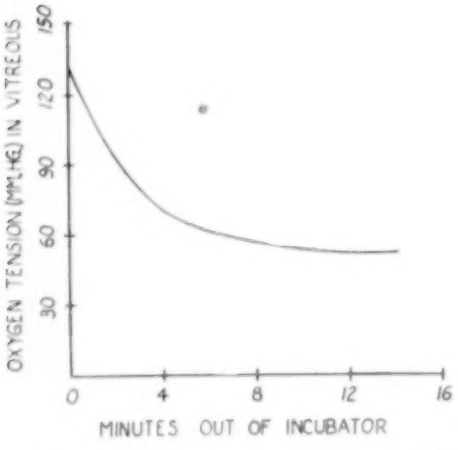

Fig. 4 (Krause and Goren). The exponential curve expressing the relationship between the oxygen tension in the vitreous humor and the length of time which the animal had been transferred from 60-percent oxygen to 20.9-percent oxygen.

DISCUSSION

When the animal was under conditions of hypoxia, the oxygen tension in the vitreous humor was subnormal. This is to be expected since the blood hemoglobin holds less than the normal amount of oxygen when the oxygen tension in the environmental atmosphere is low. Therefore, less oxygen is available to the body tissues, thereby causing a decreased oxygen tension in the vitreous humor.

When the animal was placed under conditions of increasing degrees of hyperoxia, a corresponding increase in the oxygen tension in the vitreous humor resulted until a maximum of approximately 175 mm. Hg was reached. This value was attained when the oxygen tension in the inspired air was 609 mm. Hg. It is of interest to note that the blood hemoglobin is fully saturated with oxygen at values far below 609 mm. Hg. The increased oxygen which goes into simple solution in the blood plasma under severe hyperoxia is not sufficient to explain the difference in oxygen tensions in the vitreous humor found under moderate and severe hyperoxia. For some unknown reasons, a greater quantity of oxygen diffuses into the vitreous humor when the animal is under severe hyperoxia than is the case un-

der moderate hyperoxia, although basically the same amount of oxygen is being carried through the blood vessels of the eye in both conditions. Further research is necessary before this fact may be adequately explained.

When an animal was removed from an environment in which the oxygen tension was 455 mm. Hg, and placed in air having one of 154 mm Hg, the oxygen tension in the vitreous humor was found to level off at the normal value of 53 mm. Hg after eight to 10 minutes (fig. 4). These results are in agreement with the sharp initial decrease and the subsequent leveling off of the blood hemoglobin saturation with oxygen seen when an animal is transferred from an atmosphere having a high oxygen tension to one having a normal oxygen tension.

It is well known that no blood vessels penetrate the vitreous humor. We may therefore assume that its nutritional requirements are satisfied by the diffusion of substances from surrounding blood vessels. Anatomic evidence indicates that the anterior portion of the vitreous humor derives its oxygen primarily from the blood vessels of the ciliary body, while the posterior portion receives its oxygen principally from the retinal vessels. Further investigation in both kittens and adult cats is necessary to ascertain the relative importance of the vessels of the inner layers of the eye in the maintenance of normal oxygen tensions in the vitreous humor.

Summary

1. Under normal physiologic conditions, the oxygen tension in the vitreous humor of the adult cat was 53 mm. Hg.

2. Hypoxic conditions caused an exponential decrease in the oxygen tension in the vitreous humor.

3. The maximum oxygen tension in the vitreous humor was approximately 175 mm. Hg, this value being reached when the atmospheric oxygen tension was 610 mm. Hg.

4. The oxygen tension in the vitreous humor of a cat, when it was removed from hyperoxic conditions and placed under normal physiologic conditions, was found to decrease exponentially.

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Ophthalmic Miniature

Sclerosis of the Cribiform Ligament is in itself the predisposing factor in Glaucoma, the effect of which is to obstruct the free passage of Aqueous to Schlemm's Canal.

Thomas Henderson, *Glaucoma*, London, E. Arnold, 1910, p. 136.

NOTES, CASES, INSTRUMENTS

PUPILLARY HYPOPHORIA AND HYPERPHORIA*

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In the presence of bilateral aphakia a disparity in the pupillary levels occasions a hyperphoria or hypophoria that is present *without* but not with the corrective lenses. This is illustrated by the following records in which the pertinent data are summarized.

CASE REPORTS

CASE 1

A white man, aged 35 years, complained of failing vision in the right eye for six months and of poor vision with diplopia in the left eye since childhood. Unaided acuity was: R.E., 20/80; L.E., 20/300. The right pupil was round, regular, and normally placed; the left pupillary aperture was ovoid and displaced 7.7 mm. below the level of the right. Bilateral iridodonesis was noted. With the cover test the left eye exhibited exophoria and hypophoria.

Examination of the right eye after mydriasis disclosed a slight backward dislocation of the superior nasal border of a cataractous lens. A diffuse posterior subcapsular opacity and anterior subcapsular water vacuoles were evident. The left ectopic pupil dilated fairly well and revealed a superior dislocation of the lens, the inferior edge of which was displaced posteriorly. The lens was essentially clear. The cycloplegic mydriasis permitted a refraction through the lens and the following improvement of acuity; with a +1.5D. sph., 20/50 plus pinhole 20/30.

An intracapsular cataract extraction with complete iridectomy was performed on the right eye. The postoperative course was complicated in turn by uveitis, retinal detachment, and glaucoma—all of which were treated successfully, and good vision with the corrective lens finally resulted. The balanced lens placed over the left eye unexpectedly gave that eye an even better acuity than the operated eye and also abolished a vertical diplopia previously experienced with the unaided eyes.

The final refraction was: R.E., +14D. sph. $\bigcirc$ +1.5D. cyl. ax. 5°, 20/25; L.E., +14.25D. sph., 20/25+. Tested with this correction the right eye was dominant and the muscle-balance test (red glass over right lens; white-ribbed Maddox rod over left lens) showed vertical orthophoria. Repetition of the same test without lenses disclosed 11$^{\Delta}$ left hypophoria (prism base-up over Maddox rod on left eye). The correction over the left ectopic pupillary aperture (0.77 cm. below that in the right eye) effected a prismatic correction of just this amount (14.25 × 0.77 or 11$^{\Delta}$ base-up).

CASE 2

A white woman was treated for acne at the age of 18 years by X rays. At the age of 30 years both eyes were operated for radiation cataracts. The right eye had an extracapsular extraction without iridectomy and a later discission. A clear, centrally placed pupil resulted. The left eye had an intracapsular operation without iridectomy, with a slight loss of vitreous. The left pupil became drawn up 3.6 mm.

In 1946 her distance correction was: R.E., +10.75D. sph. $\bigcirc$ +2.5D. cyl. ax. 160°, 20/13; L.E., +8.5D. sph. $\bigcirc$ +3.0D. cyl. ax. 50°, 20/25.

Tested with this correction, the right eye was dominant and the distant muscle-balance test showed vertical orthophoria. Repetition of the same test without lenses disclosed 3.5$^{\Delta}$ left hyperphoria. The power of the correction of the left eye in the vertical meridian is 9.73D. The correction over the left ectopic pupillary aperture (0.36 cm.

* From the Department of Ophthalmology, Northwestern University Medical School.

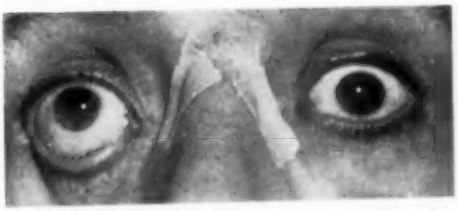

Fig. 1 (Lebensohn). R.E., postoperative aphakia; L.E., inferior corectopia with superior ectopia lentis. Bilateral visually correctable aphakia in the pupillary areas. Note the disparity of pupillary levels in consequence of which the unaided eyes evince 11$^{\Delta}$ left hypophoria for distance which is annulled by the correcting lenses.

above that in the right eye) effected a prismatic correction of the hyperphoria (9.73 × 0.36 or 3.5$^{\Delta}$ base-down).

A re-examination of the patient in 1956 showed no change in the right eye, but the correction of the left eye had shifted to +9.0D. sph. ⊂ +2.75D. cyl. ax. 35°, 20/25. The power of this correction in the vertical meridian is 10.84D. With her correction the distant muscle-balance test showed as before vertical orthophoria, but without lenses there was 4$^{\Delta}$ left hyperphoria—as could have been calculated (10.84 × 0.36 or 4$^{\Delta}$ base-down).

Comment

In an optically corrected eye the image cone approximates a point focus on the fovea regardless of the position of the pupillary aperture and the type of ametropia. In the high hypermetropia incident to uncompensated aphakia, however, the cone is truncated. In inferior corectopia, the image circle impinges then on the retina below the fovea and thus causes a hypophoria that is *primarily* optical; in superior corectopia, a hyperphoria is similarly produced. A secondary motility disturbance occurs since a displacement of the retinal image below or above the fovea reveals in the alternate covering screen-test a reflex upward or downward movement respectively in the corectopic eye.

In a primary motility derangement causing left hypophoria the image impinges on the retina below the fovea also, but in this situation the hypophoria is not cancelled by the correcting lenses. Indeed, if the lenses are properly centered the vertical muscle imbalance should be the same for distance with or without the correction. The subjective respondence to all hypophoria or hyperphoria has the same retinal basis but the distinguishing circumstance of the type described warrants the introduction of the term—pupillary hypophoria or hyperphoria.

In postoperative bilateral aphakia with an updrawn pupil in one eye, the pupillary hyperphoria then present without correction is rarely noted because the eyelid may cover the updrawn pupil and the antecedent complication, such as loss of vitreous or iris prolapse and tilting of cornea has deteriorated the sharpness of the retinal image.

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USE OF IODO-NIACIN*

For retinal or vitreous hemorrhages and vitreous floaters

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and
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Cincinnati, Ohio

The use of iodine preparations for the purpose of absorbing intraocular hemorrhages and strengthening damaged vascular walls has been known and used extensively for many years but, for some season, has recently fallen into more or less disrepute. In fact, the treatment of recurrent and massive vitreal and retinal hemorrhages and vitreous floaters has been relatively unsatisfactory with the drugs at our disposal.

Damrau[1] found that the iodides did pre-

* From the Department of Ophthalmology of the Jewish Hospital and the University of Cincinnati School of Medicine. The Iodo-Niacin used in this study was supplied by the Cole Chemical Company of Saint Louis, Missouri.

vent artificial arteriosclerosis in rabbits in which it had been produced by high cholesterol feedings.

Feinblatt, Feinblatt, and Ferguson,[2] in 1955, reported a series of 59 cases of generalized arteriosclerosis which were treated with Iodo-Niacin in full dosage for over a year with considerable therapeutic benefit and no iodism or adverse effects.

In a controlled clinical investigation using a comparable group on placebo medication, Iodo-Niacin tablets provided successful results in a series of 22 cases of retinal or vitreous hemorrhages and 89 of vitreous floaters.

The tablets contain potassium iodide 135 mg. and niacinamide hydroiodide 25 mg. The dosage used was one tablet, three times daily, after meals.

Iodo-Niacin was administered for periods of one to 13 months to an equal number of males and females between the ages of 18 and 87 years with various ocular conditions. The series included 12 cases of retinal hemorrhages, 10 of vitreous hemorrhages, and 89 of vitreous floaters.

As compared with the control group who received the placebo, absorption of retinal hemorrhages in the patients treated with Iodo-Niacin was much more rapid and complete. In a typical case of extensive retinal hemorrhages observed in the arteriosclerotic fundus of a patient with hypertension, Iodo-Niacin produced spectacular absorption in 18 days. In another case of angiospastic hemorrhages and edema involving the macula, substantial improvement was observed ophthalmoscopically after 25 days of treatment with Iodo-Niacin. The results have been recorded by before and after retinal photographs.

Results in cases of vitreous hemorrhages were also dramatic. In four postoperative cataract cases, the condition cleared completely in three to four weeks. In a diabetic case which had resisted treatment for two years, the fundus was seen with 20/70 clarity after two months on Iodo-Niacin. Results were satisfactory in five other cases of vitreous hemorrhages due to diabetes or hypertension.

Over 90 percent of the 89 patients with vitreous floaters who were treated with Iodo-Niacin showed subjective improvement, and 50 percent showed objective improvement. Large vitreous floaters appeared to diminish in size and some of the fine, dustlike opacities disappeared entirely. In several cases the vitreous floaters disappeared completely; in others, they were reduced in size ophthalmoscopically after treatment with Iodo-Niacin for one to six months. Not one of the 34 controls treated with the placebo improved subjectively after three to six weeks of observation.

Unlike other iodine preparations, for example, Iodethamin, used previously by us, no case of severe iodism occurred. Minor ill effects were noted in the form of an occasional bad taste in the mouth or pruritis with an acnelike dermatitis. The dermatitis cleared when the drug dosage was reduced from three times a day to once a day.

Summary

In a controlled clinical investigation, Iodo-Niacin gave successful results in 22 cases of retinal or vitreous hemorrhages and 89 cases of vitreous floaters.

925 Fifth-Third Bank Building (2).

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CILIA OF THE ANTERIOR CHAMBER

Report of two cases

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Los Angeles, California

Two cases of cilia of the anterior chamber following penetrating injury are presented for the interest in their discovery, diagnosis, position, and removal. Similar types of injuries were present in both patients, although one cleared up with no visual loss whatever. The second had a traumatic cataract with considerably decreased vision.

Duke-Elder* quotes three articles in which this condition occurred in 10 cases in 548,192 patients. About 234 cases were reported up to 1942, with several cases added each year. Usually the penetrating object misses the lids and cilia are rarely carried into the eye. Only occasionally do the cilia remain in the corneal wound. Usually a severe inflammation is caused by the cilia, which may clear after their removal. However, the cilia may remain in the eye apparently inert indefinitely. A thin-walled serous cyst or an epithelial pearl may follow the introduction of cilia. The epithelium comes either from the root sheath, or from epithelium which is introduced with the cilia at the time of the injury.

Case reports

Case 1

This patient, T. E., stated that in March, 1953, he was using wire cutters. The wire snapped and hit him in the right eye. At emergency surgery (done elsewhere), the doctor excised the prolapsed iris but did not suture the corneal wound. Vision of the eye was light perception. The cornea was nearly half covered with a conjunctival flap. The pupil was very small but, when dilated, a traumatic cataract could be seen. The fundus could not be visualized. X-ray examination was negative for an intraocular radiopaque foreign body. The left eye was entirely normal.

The patient had a stormy postoperative course. At one time the reaction in the vitreous was so severe that the diagnosis of vitreous abscess was made. Hospitalization lasted about six weeks. By this time, the conjunctival flap had retracted and an infiltrated corneal scar was present at the 9-o'clock position near the limbus. A dense band of tissue extended to the iris which was distorted and retracted. An opacity of the lens was present temporally but did not spread. The eye remained irritated. There were no cells or flare of the anterior chamber by the time he was discharged from the hospital but the eye remained uncomfortable. The vision was 20/100, corrected to 20/50. This man was repeatedly examined in the office every few days and at nearly every visit by slitlamp.

On July 10, 1953, nearly four months after the injury a tiny black dot appeared in approximately the center of the scar. This was thought to be a piece of foreign material. After cocaine anesthesia, under the slitlamp, using a tiny splinter forceps, this was gently touched. When finally loosened slightly the object was grasped. This proved to be the tip of a cilia which was promptly removed in its entirety. The inner end of the cilia must have extended well into the posterior chamber, since the wound was near the limbus. The eye quieted quickly.

Of more interest is the fact that the dense strand of tissue extending from the posterior surface of the corneal wound to the iris completely absorbed and disappeared in about a month; no sign of it remains. The eye has stayed in about the same condition, quiet but with the same vision due to the partial nonprogressive cataract.

Case 2

This man, J. H., was working when a wire snapped suddenly and hit him in the left eye. He had always had good vision in both eyes before the injury.

Upon examination a puncture wound of the cornea was present at about the 7-o'clock position near the limbus in the cornea of the

* Duke-Elder, W. S.: Textbook of Ophthalmology. St. Louis, Mosby, 1954, v. 6, pp. 6223, 6224.

left eye, with a considerable amount of blood in the anterior chamber. Two days later a dense, thick band of tissue could be seen extending from the posterior surface of the cornea, the inner end of the corneal wound, to the iris. No hole could be seen in the iris. With maximal dilatation no cataract could be seen in the lens.

X-ray examination reported no intraocular radiopaque foreign body.

The right eye was entirely normal. The left eye continued irritated but, after the first few days, most of the cells and flare of the anterior chamber cleared. The man stated that he had no pain in the eye. The eye continued to appear irritated, with conjunctival injection, although most of the secondary uveitis had cleared.

On the seventh day after many and repeated slitlamp observations, by illumination from the side, what appeared to be a cilia was seen in the anterior chamber, in the tissue extending from the cornea to the iris. Under anesthesia the tissue in the top of the corneal wound was removed and below this, under magnification, could be seen the tip of a cilia. The cilia was carefully grasped with a tiny forceps and removed. Again, as in Case 1, the dense strand of tissue from the corneal wound to the iris promptly absorbed and disappeared; none remained.

Discussion

These two cases point up many interesting things, although, certainly, two cases are far too few to make any generalizations. One point is that continued observation under the slitlamp is of paramount importance for diagnosing irritated eyes following penetrating injuries. A second is that the presence of cilia in an eye should be suspected, especially when a dense strand of tissue extends from the cornea to the iris. Cilia with one end in the corneal wound are easily removed when the diagnosis is made, and are certainly much more easily removed than cilia lying free in the anterior chamber.

It is also of great interest that in these two patients the dense strand of tissue connecting the cornea and the iris was reaction to the cilia, and this cleared completely after the removal of the cilia even after it had been present in the eye for four months (Case 1).

Summary

Two cases of cilia of the anterior chamber have been presented, both with the tips of the lash in the corneal wound following penetrating injury. In each case the eyes remained irritated until the removal of the cilia. The tissue extending from the posterior surface of the corneal wound to the iris completely absorbed. The diagnosis was made only after repeated slitlamp observations.

523 West Sixth Street (14).

MODIFIED SNELLEN SUTURES*

For persistent prolapsed chemosed conjunctiva: A case report

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Evanston, Illinois

Ectropion, especially of the senile type, is a relatively common condition and there are a large number of excellent corrective procedures for its relief. However, an extreme degree of ectropion resulting in prolapse and chemosis of the conjunctiva is rare and presents a most difficult problem for the ophthalmic surgeon. Following is the second case report of a technique first described by Laval and Schneider in the *Archives of Ophthalmology*, September, 1947, page 375, for the treatment of chemosed, everted, exposed conjunctiva of the lower lid.

History. Mrs. M. J., a 39-year-old Negress, was first seen at the Illinois Eye and Ear Infirmary on January 19, 1949. She stated that three months before she awakened one morning with her eyes red, swollen, and bulging between the lids. This condition grew steadily worse and about one month later she entered another hospital for treatment.

* Presented before the Chicago Ophthalmological Society, December, 1952.

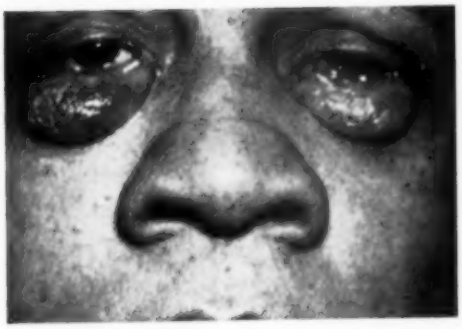

Fig. 1 (Barrett). Before treatment.

A summary from this hospital disclosed that she had a severe bilateral exophthalmos for which a right-sided orbital decompression was done. This did little good and heavy doses of X rays were given to the pituitary for two weeks, at the end of which time the exophthalmos had receded greatly. However, during this period there was a gradually increasing chemosis and eversion of the lower lids with which condition she was discharged in December, 1949.

When first seen at the Illinois Eye and Ear Infirmary, the conjunctiva of each lower lid was intensely red, boggy, and prolapsed from the lower fornix, obscuring the lower lid margins. There was moderate bulbar chemosis and myriads of tiny hemorrhages were seen with the slitlamp. Except for a shallow ulcer at the 11-o'clock position near the limbus of the right eye, all other findings were relatively unimportant.

Treatment. The conjunctiva was scarified by multiple radial incisions on repeated occasions but to no avail. Local chemotherapy and antiobiotics and atropine to the right eye failed to halt the progress of the corneal ulcer which finally perforated, with iris prolapse.

At about this time the article by Laval and Schneider was discovered and, since it seemed tailor-made to our problem, it was decided to follow the suggestions contained therein. Accordingly, the patient was brought to the operating room, where, after initial instillation of pontocaine, cotton pledgets saturated with adrenalin (1:1,000) were applied to the prolapsed conjunctiva. So marked a reduction in chemosis was effected that the conjunctiva could be inverted with a muscle hook.

Black silk (3-0) horizontal mattress suture was inserted into the conjunctiva at the junctions of the middle with the inner and outer thirds, 10 mm. from the lid margins. Each arm of the suture was then carried through the periosteum at the inferior orbital ridge and out through the skin of the cheek and tied over cotton. The same procedure was used for each lid. A conjunctival flap was pulled over the iris prolapse and tied down.

The postoperative course was uneventful. The lids became quite swollen but this subsided gradually and completely with cold compresses. On the 12th postoperative day, the sutures were removed. The patient was discharged from the hospital a few days later. She was followed for one year without recurrence.

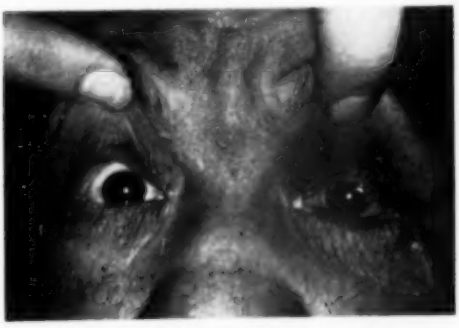

Fig. 2 (Barrett). After operation.

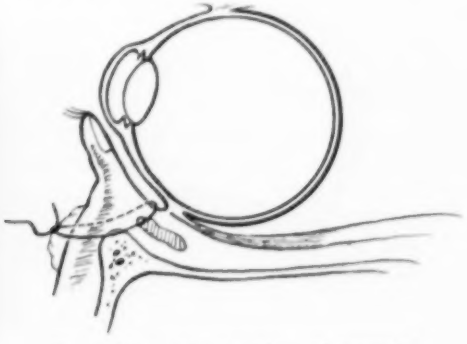

Fig. 3 (Barrett). Technique of operation.

This case has been presented because of its unusual aspects and to illustrate a very simple curative procedure for a most discomforting, discouraging, and embarrassing condition. It might be emphasized that the sutures are placed 10 mm. from the lid margin because this is the average depth of the lower fornix in the eyes-closed position. The procedure had the threefold purpose of restoring the prolapsed conjunctiva, reforming the inferior fornix, and eliminating the environment that produced a serious corneal ulcer.

636 Church Street.

A NEW TEST FOR VISUAL MALINGERING*

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Occasionally one encounters an individual making a claim under the industrial insurance provisions for loss of vision, and who has either been coached by someone else on the significance of the charts and methods used to detect malingering, or who is intelligent enough to detect these things without prompting.

In relation to letter or ring charts, the factor of which a subject is most aware is that reading the smallest letters signifies a higher standard of vision than if the larger letters only are read. So there is naturally a tendency for any malingerer to confine recognition to the very largest letters only—if any.

One of the most effective tests for malingering, therefore, is one which gives letters a different value from that which they appear to have. For instance, if two letters have the same visual threshold or recognition value, but are different sizes, and a subject says he can only read the larger of the two, he can immediately be suspected of malingering.

When Landolt broken rings are used, the visual criterion is really the width of the gap and the thickness of the limb rather than the over-all size of the ring but few potential malingerers will realize this. So, if a large ring has a small gap and a narrow limb width, the visual value of that ring will be much greater than a ring in which the proportions of gap to over-all size are conventional.

In Figure 1, the left hand chart has six rows of Landolt rings with overall sizes equivalent to 20/300, 20/200, 20/100, 20/50, 20/40, and 20/30. But the gaps and limb widths have the following visual acuity values:

Line 1. Left 20/100, Right 20/300
Line 2. Left 20/300, Right 20/100
Line 3. Left 20/200, Center 20/100, Right 20/50
Line 4. 20/40, 20/50, 20/50, 20/40
Line 5. 20/50, 20/50, 20/30, 20/30, 20/40
Line 6. 20/40, 20/40, 20/30, 20/30, 20/30

If, therefore, a subject admits to seeing the top line, he has at least 20/100 vision, and should also be able to see the right-hand ring on the second line, and the center ring on the third line, as well as the first rings on the second and third lines. If he will not admit to this, he is immediately suspected.

The letter chart to the right (fig. 1) has a similar principle. Because each letter has its own specific threshold value, it is possible to find two letters of equal size but different acuity values. In the chart shown the values are as follows:

1. U—20/300, W—20/250
2. A—20/250, T—20/250, S—20/220
3. N—20/220, C—20/175, B—20/130
4. L—20/130, O—20/120, O—20/75, W—20/75
5. N—20/75, F—20/75, A—20/75, W—20/45, B—20/45
6. C, T, U,—20/45, G, R, S,—20/35

It will be obvious from this that anyone reading the last letter on a line must also read the first letter on the next line, for the last letter on any line has the same visual value as the first letter on the next line down.

This has been checked by alternative methods of measuring and the maximum difference in acuity found between the last

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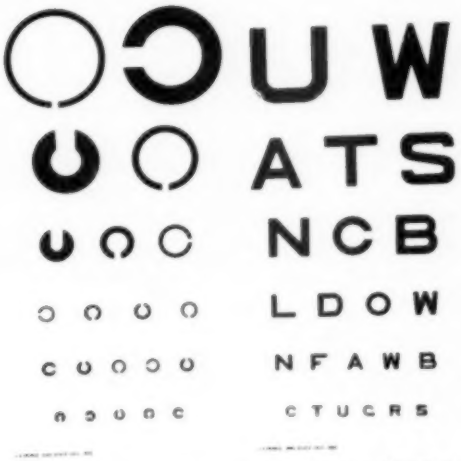

Fig. 1 (Prince). Chart to test visual malingerer.

letter of a line and the first of the next was two percent, and that was between the first and second lines, where the letters are largest.

It is preferable to use the letter chart first and the Landolt ring chart after this. Then the subject can be told that, having established a loss of vision in the eye or eyes under examination in the first test, the second is designed to discover just which area of the eye is most damaged. All the subject has to do is state in which direction of the clock, that is, six o'clock, 12 o'clock, and so forth, is the break in any of the rings he can manage to discern.

One subject tested by this method admitted to reading the third line of letters and no more, which gave acuity of 20/100—but when confronted with the Landolt rings only admitted to seeing the ring equivalent to 20/200. But this was an exceptionally intelligent subject, who was well armed with suspicion.

The test as described has also been used to allay suspicion of malingering in conventional tests when a patient has proved exceptionally dull, and the testing charts involved were not easily decipherable to them. The clean bold unserifed type of the chart illustrated in Figure 1 seems more encouraging to this kind of patient, and the responses are less reluctant. The simplicity of the Landolt-ring part of the test appeals to them and they usually show less hesitation than the intentional malingerer.

In order to test the efficacy of this test before use, a number of senior medical and optometry students were selected and told to assume that they were making an industrial insurance claim for reduction of vision, and they were to malinger deliberately.

It was found that in most cases, even their knowledge of letter charts did not avail them when they were confronted with the Landolt rings, and they invariably revealed their malingering in this.

The test should always be applied with full correction to avoid any astigmatic influence on the Landolt rings.

SUMMARY

Two charts have been designed to detect malingering. One consists of letters in which the differences between their visual thresholds have been used to produce a situation in which the last letter of any line has the same value as the first letter on the next line following it. The subject who reads all of a line, but claims he is unable to read any of the next is suspect.

The second chart consists of Landolt rings in which the size is not related to the width of the break. The width of the break is the criterion for assessing visual acuity, whereas the subject assumes it is the overall size.

Prince, J. H.: Improvements of letter styles in sight-testing charts. Texas Reports on Biology and Medicine, **12**:370-382, 1954.

A VOLTAGE CONTROL FOR THE ELECTRONIC TONOMETER*

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Ever since the introduction of tonography as a diagnostic aid in ophthalmology,[1] there

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Fig. 1 (Askovitz). A voltage control for the electronic tonometer.

has been an increasing interest in the electronic tonometer.[2] The ease of manipulation of the tonometer head and the large scale on the meter have contributed to its popularity. However, as is the case with many electronic devices, proper attention must be paid to various electrical details. With the electronic tonometer, the most important of these are the assurance of a stabilized voltage supply and an adequate ground connection.

The effect of varying voltage upon the apparent tonometer readings was pointed out some years ago[3] and again more recently.[4] Since a number of tonometers have been referred to our laboratory for checking, it was decided to combine the features of a previously described stabilizer unit[5] with a mechanism for intentionally varying the output voltage.[6]

Accordingly, a new instrument was assembled, which not only provides a stabilized voltage for ordinary usage (and tests the ground connection), but also makes possible observation of the effect of changes in voltage. The power plug is connected to a wall outlet (105 to 125 volts, A.C.) and the grounding clip is attached to a bare waterpipe or other metal plumbing fixture. The tonometer cord is plugged into either outlet on the right and the tonometer ground clip attached to the adjacent ground post, without having to unwind the fine ground-wire.

The main switch is turned on and the voltage regulator knob adjusted so that the output voltage on the meter will read 115 (or 110 or 117 in the case of certain special instruments). If the protecting fuse should ever burn out because of a short circuit or other reason, this will be signified by the built-in pilot light in the illuminated fuse mount on the top panel.

To test the ground connection, the lever switch is momentarily depressed. The green pilot light above it should light up. If not, another grounding site must be attempted until a satisfactory one is secured. To test the effect of changes in voltage upon the tonometer, the voltage regulator knob may be adjusted as desired, or, if one wants a sudden change of about 10 percent in the voltage value, this may be obtained by turning the "booster" switch on and off.

The basic component of the entire apparatus is an isolation stabilizing transformer,[7] which converts any incoming voltage from 105 to 125 into a stable 115 volts. This, in turn, is passed through a variable autotransformer[8] with an output voltage from zero to 115. Since the output current is electrically isolated from the incoming power lines, the danger of shock to the patient or the observer is practically eliminated. The cords have been made detachable for ease in transporting the unit.

In addition to its use with the electronic tonometer and similar equipment, a voltage control may also be of value with diagnostic instruments, wherever surges of higher voltage lead to burned out filaments, or where insufficient power prevents full brightness of the bulbs.

SUMMARY

A new electrical unit is described which supplies stabilized power for electronic tonometers and other instruments, checks ground-wire connections, and provides a variable voltage for testing purposes.

York and Tabor Roads (41).

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TEMPORAL ARTERITIS SYNDROME

A CASE REPORT

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Rochester, New York

CASE REPORT

History. A 68-year-old white man was first seen by me on July 20, 1955. The presenting complaint was that of blindness in both eyes. The history revealed that the patient had had no ocular difficulties until 10 days previously. At that time there was sudden clouding of vision which cleared in approximately three minutes. A few days later there was a similar attack of blurred vision, lasting approximately four minutes. On July 18, 1955, on awaking the patient found that he could not see with either eye. On direct questioning the patient admitted that intermittently for several weeks he had had severe pain and tenderness in the temporal areas and prominence of the vessels in those areas. He had been under treatment for arthritis and neuritis during the past two years and his symptoms had been worse during the previous two months.

Ocular examination showed vague light perception in each eye. The adnexal structures presented no abnormalities. The right pupil measured 6.0 mm. in diameter and the left pupil measured 6.5 mm. There was a very faint reaction of the right pupil to direct illumination with the slitlamp. The left pupil seemed fixed. The intraocular pressure was normal in each eye.

Slitlamp examination was negative except for a few cuneiform cortical opacities in the nasal equatorial region of the right lens.

Ophthalmoscopic examination of the right eye revealed a good orange-red reflex and clear vitreous. The optic disc was hazy and the border was blurred nasally. The retinal arterioles were markedly narrowed except for a cilioretinal branch that extended from the temporal aspect of the disc toward the macula. The retinal veins showed well-marked segmentation of the blood column. There was definite edema of the retina except for that portion which lay between the fovea centralis and the temporal disc margin. There were no hemorrhages.

Ophthalmoscopic examination of the left eye revealed a good orange-red reflex and clear vitreous. The optic disc was markedly hazy and the disc border was completely obscured. The retinal arterioles were thread-like and the veins demonstrated segmentation. The entire retina was edematous and there was a well-developed cherry-red spot in the macula. Examination of the temporal cranial areas revealed prominent and cord-like vessels.

Course. In view of the ocular findings of central retinal artery obstruction together with a history of marked tenderness and prominence of the temporal cranial vessels, a diagnosis of temporal arteritis syndrome was made. The patient was hospitalized and a course of intravenous ACTH (20 units/1,000 cc. 5.0 percent glucose daily) was

given over a period of 10 days. Admission blood and urine studies were within normal limits.

Biopsy of the right temporal artery was performed on the eighth day following the patient's admission to the hospital. Microscopic study of the removed portion of the artery revealed a definite inflammatory infiltration of all layers of the vessel wall. The cells were primarily polymorphonuclear leukocytes and lymphocytes. No giant cells were evident.

On discharge from the hospital, there was only questionable improvement in light perception in the right eye. However, follow-up evaluation on November 5, 1955, revealed uncorrected visual acuity in the right eye to be 20/30− for distance and J4 at 14 inches with a +2.5D. sph. There was still only vague light perception in the left eye.

Tangent screen studies revealed that the central field of the right eye was constricted nasally to slightly less than five degrees but there was a temporal expansion of from 10 to 15 degrees with an 18 mm. white test object at one meter.

Ophthalmoscopic examination of the right eye revealed that the optic disc was of fair color and that the borders were sharp. The retinal vessels appeared normal except for moderate narrowing of the arterioles. There was no retinal edema and the macula was clear.

Ophthalmoscopic examination of the left eye revealed marked pallor of the optic disc. The retinal arterioles were narrowed. The retina was free of edema and the macula was clear.

SUMMARY

Because of the ocular findings and an awareness of the frequent connection between occlusion of the central retinal artery and temporal arteritis, the diagnosis was successfully made in an otherwise baffling case. Biopsy study confirmed the initial clinical impression.

277 Alexander Street.

COMBINED TRANSILLUMINATOR-CAUTERY*

FOR RETINAL DETACTMENT OPERATIONS

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Philadelphia, Pennsylvania

The instrument to be described is one that may eliminate some of the difficulties attendant upon retinal detachment surgery and reduce the time of operation. The instrument has been devised to allow the operator to know, by direct observation of a focal spot of light through the pupil, the exact location of the electrode as he applies the cauterizing current.

Osmond and Amenabar have devised instruments for localization of the tear by diathermy marking of the scleral surface.[1] Their instruments are somewhat limited in usefulness in that they do not permit the operator to observe cauterizing effects of the current as it is applied.†

The present instrument had been designed and intended for cauterization of experimental fundal tumors[2] in the rabbit eye, as part of a larger series, in which several therapeutic methods of treatment for this lesion were compared.‡ It consists of three elements (fig. 1):

(a) Battery handle, (b) curved lucite tube with a central movable or immovable electrode, (c) movable collar controlling the length of the electrode. The lucite tube is curved to a 70 degree slow angle, its end is three mm. in diameter, and the electrode tip lies in its center. Three models are shown in Figure 1: (A) is a transilluminator with a penetrating electrode, (B) is the same type with an opaque coating, (C) is a transilluminator with a nonmovable surface central

* From the Wills Eye Hospital Department of Research, Irving H. Leopold, M.D., director. This work was supported by the Damon Runyon Fund 254A(T).

† Available through R. O. Gulden Co., Philadelphia, Pennsylvania.

‡ To be published.

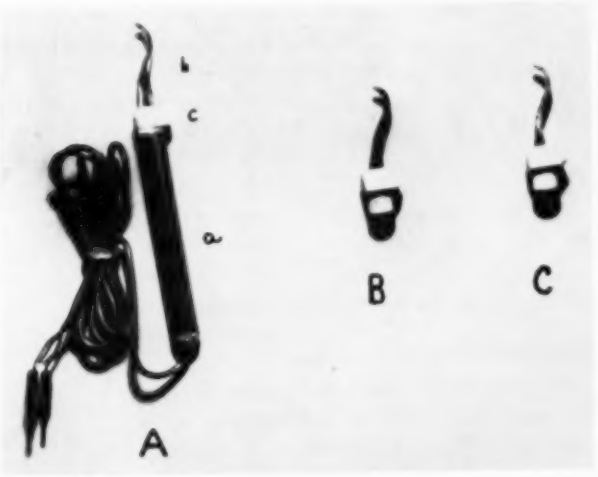

Fig. 1 (Vogel and Kaczurowski). Combined transilluminator and cautery. (A) With penetrating electrode. (B) With "mirror" silver vacuum coating and "porthole" for electrode. (C) With nonmovable surface central electrode.

electrode which is 0.5 mm. above the flat surface of the tip.

The usual operative approach and closures to the posterior half of the eyeball may be employed. The tear location which has been studied before hand is slowly approached with the transilluminator-cautery by laying the tip on the sclera. The eyeball is steadied with fixation forceps, by the assistant, or by the operator himself, until the tip is near the desired area.

The light from the instrument tip can be observed with the naked eye and ophthalmoscopic guidance can be deferred if desired because the fundus is seen as a small erect image. The usual appearance is a grayish-yellow hole against a pink background formed by the detached retina.

The location of the cautery tip is known constantly and can be followed intimately because it is in the center of the visible light source. Surface barrage (fig. 1-C) can be laid down in the surrounding area as the surgeon watches with ophthalmoscopic guidance and sees the relationship of these preliminary lesions to the tear. Penetrating cautery to close the tear can then be done using Figure 1, A or B model.

A discrete spot of light (B) avoids confusing glare and one is more certain of location. The noncoated transilluminator (A) throws diffuse illumination in surrounding areas and requires more practice in recognition of the brightest spot of light. The bright spot of light indicates that the face of the transilluminator and hence the electrode is flat against the sclera. Diffuse illumination, however, is useful in orientation because vessels, folds, and striae are thrown into relief, which when one is familiar with their transilluminated picture act as guides to the tear.

Summary

An instrument—a combined transilluminator-cautery—is described which permits direct ophthalmoscopic guidance of localizing surface and deep cautery lesions in retinal detachment operations.

1601 Spring Garden Street (30).

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SOCIETY PROCEEDINGS

Edited by DONALD J. LYLE, M.D.

COLLEGE OF PHYSICIANS OF PHILADELPHIA

SECTION ON OPHTHALMOLOGY

April 21, 1955

DR. EDMUND B. SPAETH, *Chairman*

ELEPHANTIASIS NOSTRAS

DR. ARTHUR BOBB, JR. (Read by DR. HANHAUSEN, by invitation) presented a report of a 59-year-old man with bilateral painless swelling of the lids of 11 years' duration. Examination revealed nontender, diffuse, bilateral nonpitting edema of the upper and lower lids which resulted in protrusion of the latter by two cm. from the orbital margin. There were no other significant positive findings on physical or laboratory examination. The excess tissue in the lower lids was removed surgically. Microscopic examination of the excised tissue was characterized by diffuse infiltration of the subcutaneous tissue and orbicularis, with chronic inflammatory cells, extensive fibromatosis, and increased number of blood vessels and lymphatics. A diagnosis of elephantiasis nostras was made. The clinical and pathologic features of this disease were discussed.

This is believed to be only the second such case recorded in the American ophthalmic literature.

Discussion. DR. GLEN GIBSON: I should like to thank Dr. Hanhausen for his capable presentation of this case report for Dr. Bobb who is absent this evening.

Dr. Bobb made the diagnosis and did the operation on this patient. The presence of my name on this paper was a source of surprise and embarrassment to me, because my only positive contribution to it was to misdiagnose the condition.

The justification for this presentation is, first of all, the rarity of the condition, and, secondly, the remarkable relief afforded by a relatively simple surgical procedure for this patient's inability to read due to the fact that the redundant skin completely covered his bifocal segments.

The problem of differential diagnosis may be difficult, at times, due to the numerous local, intracranial, and systemic etiologic factors which may be responsible for somewhat similar clinical conditions. Examples of the various types of conditions which warrant differential diagnosis may be illustrated by some slides.

Slide 1 is a photograph of a patient which illustrates unilateral lid enlargement due to a local chronic and recurrent inflammatory condition which is in the lids or orbit, due to a large variety of different organisms. That was a case of lymphedema due to a circumscribed abscess in the lid. It was nontender and remained for many months after the original inflammatory process had subsided. This was probably due to enlargement of lymphatics, as described by Dr. Hanhausen.

Slide 2 illustrates a diffuse neoplastic condition which may arise from tumors of the blood vessels, lymphatics, or nerves. This particular one is an elephantiasis of the lid due to hemangioma, the specimen of which is shown in the inset.

Slide 3 shows an example of chronic lymphedema due to a nondiffuse type of neoplastic disease, a primary carcinoma of the antrum. This photograph was taken one year postoperatively after the removal of the eye, the floor of the orbit, and the major part of the antrum. Notice that the edema ends abruptly at the margin of the orbit where the fascia attaches to the periosteum at the margin of the orbit. This is nontender, and the tumor has been removed, yet this highly edematous process persists.

Slide 4 is an example of a lymphedema of the eyelids which is due to an intracranial process. This man's difficulty is the result of traumatic carotid-cavernous fistula which followed a gunshot wound of the orbit.

Slide 5 illustrates an extreme example of a lymphedema of the upper and lower eyelids due to an intracranial cause. This patient has a large meningioma which is intracranial and involves the frontal lobe. It extends through the optic foramen, and has produced a large bony defect. It is most probable that this is complicated by the presence of carotid-cavernous fistula because there are marked pulsations of the markedly distended lids. This patient has been seen by numerous neurosurgeons, and the consensus is that it is inoperable.

Slide 6 is an example of an extreme case of lymphedema of the eyelids due to a systemic cause. This patient was found to have an advanced degree of myxedema.

Slide 7 shows bilateral symmetrical enlargement of the upper lids due to blepharochalasis. In the initial stage of this disease there are episodes of swelling of the eyelids characterized by smooth, soft, shiny skin. In the latter atrophic stages the skin becomes thin and baggy and hangs down much as it did in this case of elephantiasis nostras. Blepharochalasis is usually differentiated from elephantiasis nostras due to the fact that this condition usually involves the upper lid, whereas elephantiasis usually involves the lower lid. There are examples, however, in which the reverse may be the case. Blepharochalasis usually affects young individuals and is characterized by marked atrophic changes in the skin in the terminal stage. It may at times present a problem in differential diagnosis.

These illustrative photographs demonstrate that elephantiasis of the lids presents a complex problem which warrants a complete survey both from the point of view of the local condition and a systemic study as well as study by roentgenology in order to find, whenever possible, the exact cause of the condition.

DR. JOSEPH V. KLAUDER: I was under the impression that this condition was originally described by one who needs no introduction to ophthalmologists—Jonathan Hutchinson. He described the condition just before the turn of the last century, and labeled it solid edema of the face.

Since its original description there has been considerable amplification of our knowledge of elephantiasis nostras. As you know, its clinical concept comprises an inflammatory and a noninflammatory phase. This was well illustrated in the lantern slides presented by Dr. Gibson.

In differential diagnosis one should consider the pathologic process called the Melkersson-Rosenthal syndrome. Comparable to elephantiasis nostras, this syndrome is characterized by recurring localized swelling with or without fever, and eventually terminating in permanent swelling. The usual site of the swelling is the upper lip, but any area of the face may be involved. This swelling comprises one manifestation, the initial one of the syndrome; the other symptoms are an enlarged plicated tongue and finally facial paralysis. The two later symptoms, of course, do not ensue in elephantiasis nostras. Only in the early stage of Melkersson-Rosenthal syndrome is there clinical resemblance to elephantiasis nostras.

Mention may be made of the following comprehensive review of this syndrome: Touraine, R. L.: Le syndrome de Melkersson-Rosenthal, Ann. de Dermat. & Syph., **18**:409-414, 1954. The disease is apparently uncommon in America. Most of the reported cases have appeared in German and Swiss literature.

I first became acquainted with the disease when visiting German clinics a few years ago, where I saw several patients who had the disease. The histopathologic picture of the localized swelling is tuberculoid and is unlike that of elephantiasis nostras. The opinion has been expressed that the disease is an expression of sarcoidosis. The evidence of this, however, is not too convincing.

Pituitary apoplexy

Dr. Henry A. Shenkin reported two cases of acute hemorrhage into a pituitary adenoma, with resulting amblyopia. In addition, the hemorrhage in one patient caused an acute hypothalamic and addisonian crisis. Prompt surgical intervention (within eight hours in one patient and three days in the other) permitted complete recovery of vision in one patient and recovery of useful vision in the other. Surgical decompression did relieve one patient of a severe endocrine crisis and hypothalamic dysfunction by removing pressure from remaining normal pituitary tissue and the hypothalamus.

Tonography

Dr. Robert W. Spencer (by invitation), Dr. Ernest D. Helmick (by invitation), and Dr. Harold G. Scheie gave a description of some of the more important difficulties encountered when beginning to utilize electric tonography and the results of a rather large number of control studies on normal eyes. A number of precautions must be meticulously observed to avoid possible sources of error. The more important among these are a comfortable position for the patient in a quiet room, loosening of a tight collar or necktie, adequate topical anesthesia, satisfactory retraction of the eyelids, good fixation, and the correct application of the tonometer.

The greatest difficulty was encountered in variations of voltage output from one electronic tonometer to another. Ideally a Mueller electronic tonometer should have a voltage output of approximately 250 mv. with a panel reading of seven for use with the Sanborn recorder system. Solutions to this difficulty are discussed.

Control studies were instituted in normal eyes to determine the consistency of tonographic measurements performed on the same eye at different times. There is an average variation in the coefficient of outflow in repeat tracings on the same eye at the same time of day of ± 0.036 cu. mm./min./mm. (Hg) or ± 16.5 percent. In attempting to determine the variability in the coefficient of outflow in the same eye studied at six-hour intervals over a 30-hour period, we find an average variation of ± 0.45 cu. mm./min./mm. (Hg) or ± 19 percent. In a similar study the variability of the coefficient of outflow in five tracings done in the same normal eye at various times of the day over a five-day period was ± 0.053 cu. mm./min./mm. (Hg) or ± 25 percent.

The range for the coefficient of aqueous outflow in 140 normal eyes was from 0.11 to 0.42 cu. mm./min./mm. (Hg). In 96 percent of the eyes the values were found to be above 0.15 cu. mm./min./mm. (Hg). In 240 tracings on 140 normal eyes we found an overall average coefficient of outflow of 0.224 cu. mm./min./mm. (Hg).

Twenty normal eyes in each decade from age 11 to 90 years were studied to determine any significant changes in the coefficient of outflow in various age groups. No significant change was observed.

It was found that accurate calculations of the coefficient of outflow could be made from readings taken directly from the electronic tonometer rather than using the Sanborn recorder system.

The authors presented certain difficulties encountered in setting up the apparatus and learning the method described by Grant. Control studies by us gave results comparable to those reported by others. There is a definite average variation of approximately ± 0.04 cu. mm./min./mm. (Hg) in the coefficient outflow which must be taken into consideration in evaluating any given eye.

Discussion. Dr. Cyril M. Luce (Philadelphia): I would like to congratulate Dr. Scheie and his group on the excellent work that they have done with tonographic studies. At Wills Hospital we also have had a few problems with our tonometer, some of them similar to the ones that these men have encountered. We use a Leeds and Northrop recording instrument. I think in

general that, probably, the Sanborn is the easier one to handle. We found first that the zero point of the recorder did not coincide with the zero on the tonometer scale, and we had quite a drift in the zero point. We had a number of consultations with the engineers, who felt that the zero drift was due to a change in voltage output as the tubes of the tonometer heated. So it was necessary for us to take daily calibrations with it, and readjust each day the zero point with the tonometer. We purchased a new electric tonometer, and found that it gave us an entirely new set of zero points, and again we had to restandardize the machine. We used resistors similar to the ones used on the Sanborn. Dr. Askowitz kindly helped us to assemble a constant voltage transformer. Our current at Wills apparently is not as stable as that at the university. It was necessary for us to have a movable lamp for fixation. We still have one problem that we have not solved, and that is how to secure fixation in a one-eyed person. We have had some difficulty with them.

At present we have done tonograms on about 350 patients, a number of whom have had repeat studies, and we have been interested partly in how tonograms correlate with other diagnostic procedures for glaucoma, including water provocative tests and mydriasis tests, and also we have been interested in tonograms prior to surgery and those taken after surgery. The 157 patients who have had these studies fall into one of the following groups:

Tonograms and water provocatives 23 percent, and 32 percent have had mydriasis tests, and we have had 38 percent of this 157 who have had tonograms prior to surgery, and we have had only four patients' tonograms after surgery.

Of the 13 who have had both water-provocative tests and tonograms only one was positive on both. Two had negative water-provocative and positive tonograms. One had negative water-provocative and tonogram. In the doubtful range of 0.11 to 0.15 we found a positive water and negative tonogram on two occasions.

Of the 18 patients who had mydriasis tests, tonograms and mydriasis test were positive in four. In 18 who had tonograms prior to surgery, all except four patients had greatly impaired outflow, and in those who had tonograms after surgery two had reached the normal outflow and two of them continued impaired.

At present at Wills we consider tonography most useful on a clinical basis in the diagnostic survey of glaucoma suspects, and it has been of a great deal of use to us in the evaluation of cases for proper surgical procedure, especially relative to whether filtering or nonfiltering procedures should be done. In the evaluation of postsurgical cases, it has been useful in evaluating the failure or success of the surgery, especially in trephining operations or cyclodialysis which can be correlated through gonioscopy with the tonogram.

Dr. E. Howard Bedrossian: I wish to congratulate Dr. Spencer on the very important and useful information he has given us. He has shown two important facts. One is that there may be a large variation (as much as 25 percent) in tonographic readings taken at the same time of day, but on different occasions, in normal individuals. The second is that a recording device is not absolutely essential for accuracy, since the data obtained are just as reliable by taking initial and final readings as when a recording device is used.

I, too, feel there is a definite variation in individual readings. Therefore, before I draw any conclusions I take the average of at least three morning readings and an average of at least three evening readings on the same patient. In this way the normal variation in readings taken at the same time of day may be reduced to a minimum. In the patients that I reported at the last annual Wills Eye Hospital conference, I had taken the average morning and average evening readings, and then compared the rate of

formation with the rate of outflow of aqueous. The findings in chronic simple glaucoma showed a definite phasic variation in the coefficient of outflow. The facility of outflow was diminished in the morning as compared to that of the evening readings.

If one takes tonographic readings every four hours for a period of only 24 to 36 hours, the individual variations in the normal may be so much that one obtains insignificant or erroneous phasic variations. However, if one takes an average number of readings, say at least three or four readings, for the morning and then three or four readings for the evening, one may then be able to show some significant changes during the different times of the day, in coefficients of outflow.

Dr. Spencer's findings certainly have convinced me that one aqueous outflow study alone is not enough to make a definite diagnosis, especially in borderline cases, and therefore it is extremely important that aqueous outflow studies be repeated at least two or three times on different occasions before a definite diagnosis is made on the basis of this test alone.

Dr. Francis Heed Adler: The work presented this evening is certainly a labor of love, but not "love's labor lost." History repeats itself, and every time we have a new method developed in the laboratory, and applied clinically, we find reports in the literature which are premature because inadequate control tests have been done.

You will recall that a few years ago certain instruments were devised to measure dark adaptation which were applied clinically before adequate controls were run. The literature was flooded with reports of school children supposed to have subclinical vitamin-A deficiency on the basis of these dark adaptation determinations. In many other clinical conditions it was claimed that the patients were suffering from vitamin-A deficiency because of these studies. All of these eventually turned out to be erroneous, simply because the method had not been adequately tested, and due chiefly to the work of Hecht and Schlaer the necessary controls were worked out.

The type of work presented this evening represents a back-breaking job, which in a way is really a great sacrifice, but it is work which lays the sure foundation for future knowledge, and for that reason I feel the authors deserve our thanks and congratulations. We now have in the literature adequate controls for tonography, and as we read subsequent reports we will be in a far better position to say whether or not the data presented are or are not significant.

Dr. Harold G. Scheie: We have discussed some of the difficulties encountered by us in beginning tonography. As you have learned from Dr. Spencer's presentation, some of them were overcome only after considerable delay. The most annoying of our troubles was lack of standardization of tonometers. Each of those used by us had to have the voltage output altered considerably, such that it fell within the range which could be registered on a Sanborn recorder. We were aided by Dr. Morton Grant and The Sanborn Company in overcoming this. Fortunately, the electric current in our laboratory was sufficiently stable that fluctuations in voltage supplying the tonometer were of no consequence.

Once our apparatus was working well, it seemed necessary to do control studies on normal eyes: first, to check our own technique and also to reinforce similar control studies in the literature. It seemed unwise to proceed with the method in glaucomatous patients until the method in our hands seemed of accuracy equal to other workers. As reported by Dr. Spencer, you have learned that the lower limits of aqueous outflow was 0.15 cu. mm./min./mm. (Hg), a figure compatible with that of other workers. There is a definite plus or minus error in tracings repeated in the same eye of approximately 0.045 cu. mm./min./mm. (Hg), which means that any tracing of, for example, 0.16 cu. mm./min./mm. (Hg) could

be interpreted as either 0.205 or 0.105, the one being a fairly normal value and the other definitely abnormal. It is, therefore, impossible to make an arbitrary interpretation of a single tracing.

Although electrotonography is of some diagnostic value, it should not be considered as supplanting other more easily obtained clinical findings. We also believe that this is true when used in following the patient with simple chronic glaucoma; if, for example, the patient's field remains unchanged and his tension is well controlled, operation should not be done regardless of the facility of aqueous outflow.

Dr. Grant has made a brilliant contribution to our understanding of the mechanics and classification of glaucoma, but we feel that many observations will have to be made to determine its exact status in the clinical management of glaucoma other than as a diagnostic aid.

William E. Krewson, III,
Clerk.

NEW YORK SOCIETY FOR CLINICAL OPHTHALMOLOGY

April 4, 1955

DR. FREDERICK H. THEODORE, *President*

SAFETY MEASURES IN CATARACT SURGERY

DR. GEORGE B. CORCORAN, JR., Springfield, Massachusetts, divided the subject into eight categories:

1. Practical preoperative patient evaluation.
2. Use of suggestion to obtain better doctor-patient relationship.
3. Proper preoperative medication.
4. Complete akinesia and anesthesia.
5. Production of a low tension eye.
6. Direct zonular stripping.
7. Safe tight closure of the wound.
8. Early ambulation.

He pointed out that his operative and preoperative methods, while in part original, were largely the result of selecting those procedures which impressed him most as carried out by various eye surgeons throughout the country.

Dr. Corcoran mentioned the use of a form to be sent to the family physician to be filled out concerning the patient's physical condition. He also uses a questionnaire which he asks the patient to answer in order to forestall certain operative or postoperative complications. The use of suggestion in a fashion well illustrated by the hypnotist was discussed in regard to its efficacious effect on the patient. A point was made of avoiding excess preoperative medication.

Dr. Corcoran discussed his use of a complete facial block in the O'Brien position, and the use of 10-percent procaine with hyaluronidase and epinephrine in the retrobulbar position. He employs five minutes of ocular massage, as suggested to him by Dr. Paul Chandler. One of the methods by which massage softens the eye is the forcing of retrovitreal fluid out through the canal of Schlemm. Pischel estimates that such a state of detached vitreous exists in a large percentage of all persons 50 years of age and over.

Dr. Corcoran then described his routine use of direct zonular stripping, emphasizing the safety with which it could be done. Following that, he spoke on his use of five to seven, or more, postplaced corneoscleral sutures, which are tied very tightly and which do not have to be removed but slough out of themselves. The use of the Grieshaber, Riedel, and new hand-honed Ethicon swedged-on needles was discussed. This method of suturing enables the patient to get out of bed on the day of surgery and avoids the need for covering the unoperated eye. A colored sound motion picture of this cataract procedure was presented. It illustrated the soft, safe, immobile eye which was obtained, and showed clearly the act of direct zonular stripping in two cases.

Discussion. DR. P. ROBB MCDONALD,

Philadelphia, said that there is no question that a patient with a cataract has a much better chance of a successful operation today than he did two or three decades ago. This is the result of three factors: analgesia, anesthesia, and akinesia, better instrumentation, and a larger residency training program. Here we are primarily concerned with the first factor: analgesia, anesthesia, and akinesia.

Atkinson, two or three years ago, asked many of the ophthalmologists in this country what their choice of preoperative medication was. He reported his results in the *Transactions* of the American Ophthalmological Society. The preoperative medication preferred by most is Nembutal, 1.5 to 3.0 gr., combined with Demerol, 50 to 75 mg., preoperatively. To this we have recently been adding 25 mg. of Thorazine.

The dose is adjusted to some extent, depending upon the age of the patient. It is well to give a test dose of the medication the evening before; it does not always hold that a larger dose of the medication will give one more analgesia. There are certain patients who will snore throughout the preparation for the operation, yet even after akinesia and a retrobulbar block, if one touches their superior rectus muscle, they will practically jump off the table and they are quite irrational. One must be careful, therefore, not to prescribe an overdose of the preanesthetic medication.

One of the greatest safety factors has been the development of satisfactory akinesia by either the Van Lint or O'Brien techniques, or a combination of both. I am always surprised at how few people follow O'Brien's technique and inject the anesthetic solution only after the needle strikes the condyle of the mandible. Failure to do this procedure correctly may result in faulty akinesia with untoward results. The technique of nerve blocking has not been changed but newer, more potent, and longer-lasting anesthetic solutions are now available.

All will agree that good akinesia is essential for safe cataract surgery. Five to 10 cc. of a four-percent solution of procaine or two to five cc. of a one-percent solution of Lidocaine, correctly placed, will produce satisfactory akinesia from 40 to 60 minutes. I personally like to combine this with 0.5 cc. injected into both upper and lower lids to give anesthesia of the skin surface as well as to supplement the akinesia.

Anesthesia of the conjunctiva and cornea is quite satisfactory using a 0.5-percent solution of pontocaine. This is supplemented by the retrobulbar injection of an anesthetic solution. There is no question that the addition of hyaluronidase enhances the diffusion of the anesthetic solution and reduces the intraocular pressure. Various concentrations of procaine have been used, from one to 10 percent.

Scheie has recently reported on the use of Effocaine and a new anesthetic, U-0045. Effocaine proved to be too toxic but U-0045 produced an anesthetic effect lasting several hours. U-0045 is much more potent than procaine and also more toxic. Scheie found that 0.75 cc. of U-0045, when combined with 0.75 cc. of 10-percent procaine, gives excellent anesthesia, lasting for several hours, with minimal local tissue irritation.

I have not had any experience with U-0045, but have found a two- to four-percent solution of procaine with hyaluronidase quite satisfactory for the average intraocular procedure. If the operation is to be prolonged, a combination of four-percent procaine and 0.1-percent pontocaine gives satisfactory anesthesia for a period of one to two hours. This combination gives a much longer anesthesia than procaine alone. I think it is very important to wait two or three minutes following the retrobulbar injection and to massage the eye during this period. This permits better diffusion of the anesthetic as well as the detection of a slowly developing retrobulbar hemorrhage.

Despite adequate akinesia and anesthesia, there are times when a positive pressure appears to exist. Once the anterior chamber is open, the iris sneaks out and continues to bulge slightly as the incision is enlarged. To

recognize trouble and try to avoid it is just as important as knowing what to do if it arises. In a situation such as this, if there is no external pressure on the eye, the use of intravenous medication is often of great value. If the patient is restless, I do not hesitate to use one-fifth gr. of morphine or two to three gr. of Seconol intravenously. Following this, the use of one of the curare preparations may permit you to complete the surgery without loss of vitreous.

I seldom use general anesthesia for cataract surgery but, if a well-qualified anesthetist, who is familiar with ocular surgery, is available his services may be of inestimable value. I also prefer to have him give the intravenous curare when local anesthesia is being used. As you well know, there are many different curarelike preparations now available, and some are safer to use than others.

Dr. John H. Bailey said that the color films were excellent. He prefers preplaced sutures. It is apparent that a certain amount of pressure is exerted upon the contents of the eyeball by the manipulations incident to the passage of the sutures through the lips of the operative wound. If there be any tendency for the vitreous to prolapse, this hazard is enhanced if the sutures are introduced in an opened eyeball, that is, after the corneal section has been completed.

Dr. Bailey said that he does not use a speculum, either the conventional type or one of the more recent modifications. Instead, a bridle suture is inserted into the belly of the superior rectus muscle and another such suture in the inferior rectus. These sutures embrace the whole width of the muscle, each arm of the sutures is given a substantial divergent direction, held taut against the superior and inferior orbital margins, respectively, and fastened to a firm head dressing by hanging mosquito clamps. These sutures offer a wide operative field, fixate the eyeball, and there are no impedimenta in the operative field when a critical situation arises.

Dr. Corcoran thanked Dr. McDonald and Dr. Bailey for their discussion. He stated that he had not used pontocaine in the retrobulbar injection because of the excellent anesthesia attained with 10-percent Novocain.

As regards the question of pre- or postplaced sutures, Dr. Corcoran pointed out that what appears to be marked distortion of the globe from pressure, while placing the sutures, is actually an exaggeration; first, because of the great magnification in the film and, secondly, because the eye is so soft that the slightest pressure causes marked indentations. Actually, the chance of vitreous loss is minimal because the eyes are so soft that the hyaloid falls well behind the pupillary place. This is further substantiated in the figure showing a one-percent vitreous loss at the time of surgery which Dr. Corcoran found when examining 100 consecutive cases.

The 100-percent akinesia which is obtained in the majority of cases in which 10-percent Novocain is used obviates the need for a suture in the inferior rectus.

Functional tests in glaucoma

Dr. Adolph Posner said that functional tests for glaucoma may be defined as those diagnostic tests which reflect the functional state of the pressure-regulating mechanism of the eye. They include provocative tests, study of phasic variations of tension, and tonography. Serial charting of visual fields is useful as an index of the functional state of the eye and, in this sense, is of great diagnostic value. Strictly speaking, however, perimetry is not a functional test, since the information which it supplies refers to the result of the functional disturbance rather than the disturbance itself.

In narrow-angle glaucoma, objective signs are frequently lacking when the patient presents himself for examination. The object of functional tests should be to duplicate the circumstances under which symptoms occur. A careful history elicited from the patient often supplies clues useful for planning such tests. The dark-room provocative test is safer than the mydriasis test, but is positive

in only about 50 percent of cases. A negative result, therefore, does not eliminate the diagnosis. The therapeutic test with pilocarpine is frequently helpful. Occasionally, pilocarpine causes an elevation of tension in narrow-angle glaucoma.

Results of functional tests in chronic simple glaucoma and normal eyes differ from each other qualitatively rather than quantitatively. In the glaucomatous eye, the resistance to outflow of aqueous is fixed, whereas in the normal eye it is variable and subject to rapid changes. These changes may occur spontaneously, or they may be induced by relatively minor stimuli and not necessarily by increased intraocular pressure. In the normal eye, outflow channels have a reserve capacity of approximately five times the normal requirement.

The first pathologic change in the glaucomatous eye is a reduction in the reserve capacity for outflow. This stage may be detected clinically by a change in the response to the water-drinking provocative test and to tonography. The latter may be regarded as a refined provocative test.

Similarly, phasic variations of tension may be regarded as physiologic provocative tests. In early, or latent, chronic simple glaucoma, the tension is less stable than in normal eyes, shows greater fluctuations, and takes a longer time to return to its original level after it has been disturbed. In manifest glaucoma, the intraocular pressure rises to abnormal levels because the total outflow facility is inadequate to cope with the aqueous being formed and a higher pressure is required in order to force the aqueous through these channels.

In certain forms of secondary glaucoma associated with uveitis, as typified by glaucomatocyclitic crises, a low coefficient of outflow has been reported during the hypertensive phase. This finding, however, need not signifiy diminished facility of outflow. An excessive rate of formation of aqueous may cause the normal drainage system to become inadequate, and may thus simulate obstruction to flow.

Discussion. Dr. Joseph Pascal commented that many reports on functional tests of chronic simple glaucoma show an early and rapid loss of accommodation. He asked if Dr. Posner found this so in his experience.

Dr. Posner replied that in chronic simple glaucoma he had not observed any unusual loss of accommodation. In some cases the reading difficulties may be traced to a field defect in close proximity to the fixation point. In narrow-angle glaucoma, the elevation of tension may be accompanied by loss of accommodation especially in the younger groups of patients. Here, the cause is probably a paresis of the ciliary muscle analogous to the paresis of the sphincter muscle which also is a result of high intraocular pressure.

Dr. Frederick H. Theodore observed that it is stated that in iritis changes in the chemical character of the aqueous may account for the elevation in tension. He asked if Dr. Posner believes that the increased amount of fluid secreted, per se, is the only factor causing the increase in tension in such cases.

Dr. Posner replied that it requires a great deal of protein to increase pressure even by a small amount. It is due largely to the Duke-Elder theory of dialysis that the plasmoid aqueous theory has been perpetuated. Anatomically, there is no evidence of obstruction to outflow, so that hypersecretion is the only alternative left. The tonographic findings can be produced either by obstruction or hypersecretion.

Dr. Abraham Kornzweig referred to the small canaliculi, which are believed to be closed, according to Teng and Katzin, by a hyaline substance, and which is believed to be responsible for the attacks of glaucoma, stating it is his feeling that this opinion is based on the examination of only very few eyes. He has had a good deal of experience with pathologic examinations of

eyes of old people, and has found that the possible variations of the appearance of the trabeculae and the collecting tubules and Schlemm's canal are so numerous that he would be very hesitant in basing a theory of glaucoma on so few eyes. Until it has been confirmed by repeated examinations and other investigators, he would be inclined to keep this theory in abeyance.

Dr. Posner agreed with Dr. Kornzweig that he had not investigated this phase. It is possible that eyes from older people have similar changes and probably simple glaucoma is nothing but an expression of senility of that part of the body.

Dr. Julius M. Shier asked if Dr. Posner had done tonography under Diamox. Dr. Posner replied that he had not.

Dr. Alfred Kestenbaum commented that Dr. Posner tried to transfer the obstacles for the efflux of the aqueous from points between the angle and Schlemm's canal to points between Schlemm's canal and the episcleral veins, namely Sondermann's canaliculi. In addition, he does not assume obstacles being present in all canaliculi but a diminishing of the number of open canaliculi. Does Dr. Posner think that the canaliculi open on mechanical pressure or does he assume a nervous reflex-stimulation resulting in opening of a greater number of canaliculi?

Dr. Posner replied that the collector channels probably open not only as a result of pressure, but also as the result of nervous stimulation. The nervous factor may be responsible for the spontaneous lowering of tension in the fellow eye during tonography, frequently observed in normal eyes. The fact that this behavior is not seen in glaucomatous eyes may indicate that reserve outflow channels are lacking in such pathologic eyes.

Dr. Jesse M. Levitt remarked that our present surgical procedures increase the number of collecting channels or stimulate their development.

Jesse M. Levitt,
Recording Secretary.

NEW ENGLAND OPHTHALMOLOGICAL SOCIETY

April 27, 1955

Dr. Frank W. Dimmitt, *presiding*

The 425th meeting of the society was held in Boston.

Corneoscleral suturing

Dr. Richard H. Dennis, Waterville, Maine, described a method of corneoscleral suturing in which the suture was entirely preplaced before opening the anterior chamber. He elevates a conjunctival flap based at the limbus, uses two gutter-type incisions at the limbus at the 11-o'clock and 1-o'clock positions, and places a single strand of catgut (6-0 chromic) across the wound and pulls the loop out through the incision which has been begun. By means of a keratome the entry into the anterior chamber is completed through one of the gutters and then the incision is enlarged with scissors. After this, the cataract extraction proceeds in accordance with the desires of the individual surgeon. He compared the preplaced and postplaced sutures in regard to efficiency of preserving good configuration of the globe and tight wound closure after operation and he considered the preplaced to be considerably superior.

Discussion. Dr. F. H. Verhoeff pointed out that with his track sutures they are "preplaced" insofar as the lens extraction is concerned, and that he knows of very few cases in which difficulties arise between the time of the incision and the removal of the lens. He suggested that it would be well to accumulate data on this point before criticizing or considering any contraindications to a so-called "half preplaced suture." Other discussion was concerned with the fact that a limbal-based flap is considered more protection against epithelium in the anterior chamber than one which is elevated with an incision at the limbus.

Tract sutures in corneal grafts

Dr. Brendan D. Leahey, Lowell, Massachusetts, described a device which he has designed to enable him to make satisfactory preplacement of a track suture for holding a corneal graft in place. In carrying out his procedure he prefers to remove the cornea from the recipient eye by means of a large trephine. After cutting through, he leaves the graft in place until the donor graft is cut, using the same trephine. The donor graft is then placed in a turret-type graft holder, and, by using a Grieshaber, seven-mm. needle, he inserts his guide suture through the cornea and out the edge of the cornea, splitting the thickness, and puts a second suture just opposite the first. Similar tracks had been placed in the recipient eye prior to removing the button of corneal tissue to be replaced. The transfer graft is then placed on the recipient eye and the sutures which were previously in the graft are then threaded into the tracks on the recipient eye. He then adds additional sutures around the margins of the graft placing them directly at the time of transfer, using only two tracks for the initial placement of the transplant. After completing the procedure, an air bubble is put in the anterior chamber. In the presentation of his paper, Dr. Leahey used a motion picture which he has prepared on this subject.

So-called blindspot syndrome

Dr. F. H. Verhoeff discussed at length his views on Dr. Kenneth L. Swan's concept of "The so-called blindspot syndrome and the blindspot mechanism." After a rather detailed presentation of the physiology concerned and observed phenomena relating to strabismus, Dr. Verhoeff concluded:

"The foregoing consideration of Dr. Swan's lecture in the light of some of the established facts concerning strabismus leads to the inevitable conclusion that the so-called blindspot mechanism and the so-called blindspot syndrome are of no significant importance in any respect, of absolutely no importance in respect to treatment, and, to say the least, are unworthy of the names given them."

Highlights of glaucoma

Dr. Paul A. Chandler, Boston, presented an informal review of the field of glaucoma and his views on the problems of primary glaucoma. He divided primary glaucoma into the open-angle and angle-closure types and cited the work of Dr. Morton Grant in the development of the present concept of primary glaucoma.

The angle-closure glaucoma he divided into the two types: (1) acute glaucoma and (2) the chronic type with only partial closure of the angle. He described the acute condition as being one of the most acute diseases known to medical science, and stated that one could almost diagnose acute glaucoma over the telephone by the history of its onset. He also commented that iris atrophy is a trademark of primary glaucoma, and mentioned that when they are present the "flecken of Vogt" are pathognomonic of acute glaucoma. However, they are not present in every case. In addition he cautioned against assuming that a case is iritis just because there are cells in the anterior chamber. It was also pointed out that the glaucomatocyclitic crisis may be confused with acute glaucoma.

In treating acute angle-closure glaucoma, Dr. Chandler believes that intensive miotics together with Diamox should be instituted from the start and that unless there is a break in the tension, which should be noticed within three hours after the beginning of treatment, immediate surgery should be performed. However, if the tension has begun to fall by the end of three hours he considered it wise to wait until the tension comes to normal—if it will.

His surgical treatment in an early case of acute glaucoma is peripheral iridectomy.

This is most effective in cases which can be normalized completely by the use of miotics. In addition, he feels that surgery on the fellow eye should be undertaken without delay in order to prevent acute glaucoma in that eye.

The second type of glaucoma discussed was subacute angle-closure glaucoma. This was defined as a type of glaucoma in which the sole cause of the rise in pressure is closure of the angle. The difference between the subacute and the acute forms is due to anatomic differences in width of the chamber angle so that, in the subacute form, the entire angle is rarely closed during an episode; whereas, in the acute form, as a rule, the entire angle closes. In this type of glaucoma, he considers peripheral iridectomy to be effective if extensive peripheral anterior synechias have not formed. After that occurs, some filtering type of operation is probably necessary.

In distinguishing this type of glaucoma from open-angle glaucoma, Dr. Chandler considers it necessary at times to give the patient a trial without drops and observe the angle with a gonioscope to determine whether or not it closes or stays open. He emphasized that he does not think it wise to wait for loss of either visual acuity or visual field before undertaking surgery in angle-closure glaucoma. His criterion for surgery is a noticeable elevation of tension with the patient under faithful miotic treatment.

A peripheral iridectomy is considered sufficient for a complete and permanent cure, if the iridectomy is done early in the case. If the case is a little more advanced with some permanent peripheral synechias, as long as the tension can be brought down to normal with miotics, peripheral iridectomy is still considered to be the operation of choice, bearing in mind that some of these patients may need to continue with miotics after the operation. If this does not work successfully, a filtering operation can be undertaken.

In those cases where the tension is not controlled with the use of miotics preoperatively, some filtering operation is definitely considered indicated, and Dr. Chandler personally prefers iridencleisis. In this type of case, he also advises a prophylactic peripheral iridectomy on the patient's other eye.

Dr. Chandler then described his own personal technique for peripheral iridectomy using an ab-externo incision, and he strongly advised being sure that the angle is swept with either an iris spatula or a cyclodialysis spatula to free peripheral anterior synechias before the iridectomy is performed.

Postoperatively, he considers it highly advisable to start the use of medication immediately and suggests cortisone to control the postoperative inflammatory reaction, and the use of neosynephrine daily to keep the pupil active.

The problem of malignant glaucoma was then taken up and, for this, Dr. Chandler feels that immediate lens extraction is probably the best operation. He considers it advisable to lose vitreous anteriorly at the time the lens is removed. He advised that if vitreous does not present, the hyaloid should be incised in order to force vitreous loss by the anterior route. For patients who have had malignant glaucoma, the peripheral iridectomy for the fellow eye is a most important prophylactic measure.

In discussing open-angle glaucoma, Dr. Chandler mentioned the work by Dr. Grant and Dr. Trotter in measuring facility of outflow of aqueous and discussed the physiology involved for both production of excessive aqueous as well as reduction in outflow.

Another type of chronic open-agle glaucoma mentioned was that caused by exfoliation of the lens in which he has observed gradual increase of tension over a period of years.

In treatment of all types of open-angle glaucoma, the main criterion for surgery is to follow the visual field. As long as there is no significant loss of field, surgery may well be postponed. Also other criteria are

the age of the patient and his general physical condition.

In defining adequate medical treatment, Dr. Chandler stated that he considers minimum medical treatment to consist of one-percent pilocarpine every four hours. This is increased to two percent, then four percent, and eventually four percent every three or four hours as needed. If this does not control the tension, he adds epinephrine bitartrate two or three times a day, and, finally, before abandoning medical treatment, he turns to the use of DFP once daily.

After this routine has been carried out and the patient's tension is still running high, he feels that maximum benefit from medical treatment has been obtained and surgery must be restored too. However, before undertaking surgery, certainly Diamox must be added to the routine.

In summarizing the problem of open-angle glaucoma, Dr. Chandler stated that, whereas the treatment of angle-closure glaucoma is 90 percent surgical, the treatment of open-angle glaucoma is almost as large a percent medical. The major considerations which he listed were the age of the patient, the stage of the disease with particular reference to the status of the optic disc, the visual acuity, the field, the tension, and the patient's faithfulness in treatment. He emphasized the necessity of looking at the picture as a whole rather than any one single factor. In closing, Dr. Chandler pointed out that in all problems relative to glaucoma, policies and procedures differ with individual physicians, and that a man should do what works best in his hands, bearing in mind all the considerations in each individual case.

Discussion. In the discussion which followed, in trying to explain why some cases of angle-closure glaucoma do not respond to peripheral iridectomy, Dr. Chandler pointed out that there are two types of chambers, some which have an overall shallow chamber and others which have a normal depth in the center, but get shallow as they reach the periphery. In this latter group it is felt that the peripheral iridectomy does not offer as much chance for help.

The question was next asked what to do about patients with deep cupping and normal tension, and Dr. Chandler stated that he bases treatment in this type of case primarily on the result of tonographic studies which are done in the laboratory. In response to a question as to whether calcification of the carotids might produce field loss in this type of patient, Dr. Chandler stated he had no alternative explanation for it and that unquestionably calcification of the carotids is rather common in people in this age group but that he personally knows nothing about it.

In reply to a question as to whether he would operate on a patient with a shallow angle who had never had an attack, he stated he would not but, if the patient got an attack in one eye, then he would operate both eyes.

In discussing in which type of patients to use filtration operations and in which to use peripheral iridectomy, Dr. Chandler described his criteria as being somewhat as follows: (1) If pressure can be brought to normal with a reasonable use of miotics, assume a fair amount of the angle is open; but, if the best you can do with miotics is 35 or 40 mm. Hg or higher, then you have to consider a large part of the angle is closed permanently, and some type of filtering operation will be necessary.

Answering the question of cataract extraction to cure the glaucoma, Dr. Chandler recognized that in angle-closure glaucoma, one may cure the glaucoma by removing the cataract; but, in open-angle glaucoma, the tension may be low the first month or two but usually returns to the old level.

Dr. Chandler very strongly emphasized, in closing the discussion, the absolute necessity of routine tonometry on all patients in order to diagnose open-angle glacoma early.

David H. Scott,
Recorder.

AMERICAN JOURNAL OF OPHTHALMOLOGY

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THE ACADEMY MEETING, 1956

The 65th annual session of the American Academy of Ophthalmology and Otolaryngology was held at the Palmer House, Chicago, from October 14 to 19, 1956. A few over 6,000 members and guests attended and every minute of the day and far into the night was occupied with the usual activities of the academy that are familiar and important to its members.

The president, A. C. Furstenberg, dean of the Medical School, University of Michigan, graciously presided at the general scientific session and the special sessions of the Section on Otolaryngology. The vice-presidents, Hayward Post and Walter Atkinson, presided over the meetings of the Section on Ophthalmology.

We take for granted the smooth workings of the meetings and few of us give thought

to what goes on behind the scenes in making the annual meeting such a great success. It is truly a wonderful organization and runs like a well-oiled machine.

The Section on Ophthalmology had its scientific sessions in the mornings, beginning on October 16th.

At the joint session on the morning of October 15th, the president, in his address, chose as his title, "A look to the future." This was a scholarly approach to the projection of present trends in medicine to possible events in the near future, anticipating a large increase not only in the general population but also in the need for physicians of all disciplines and suggesting ways and means by which this demand can be adequately met.

The guest-of-honor, Dr. Frederick A. Coller of Ann Arbor, Michigan, gave a delightful talk on the "Evolution of surgery and its specialties." This was a review of the major advances in surgery and also in the specialties of eye, ear, nose, and throat, illustrated with charming pictures out of the past.

Following this address the president presented Honor Awards to 14 members of the Academy. Dr. Arnold B. Kurlander of the U. S. Public Health Service discussed the problem of glaucoma from the public health viewpoint, Dr. Melvin M. Figley of Ann Arbor, Michigan, gave a talk on "New radiologic contributions to ophthalmology and otolaryngology through vascular visualization," a summary of the modern work done in this field. Dr. Mark Lepper of Chicago gave us the latest information on "The newer antibiotics."

The meetings of the scientific sessions on ophthalmology were, as usual, overwhelmingly attended, especially during the first two days and there was standing room only in the very large ballroom in which these meetings are held. The subjects of the papers presented offered a wide variety of information and were all of unusual importance, a number of them outstanding. For example, the XIII Jackson Memorial Lecture on "The lens epithelium in the pathogenesis of cataract," by Dr. Ludwig J. K. von Sallmann of Bethesda, Maryland; "The treatment of retinal detachment by vitreous implant," by Dr. Donald Shafer; the symposium on "Postoperative cataract complications," given by Dr. Michael J. Hogan of San Francisco, Dr. John M. McLean of New York, and Dr. A. Edward Maumenee of Baltimore; "The treatment of retinoblastoma with radiation and TEM," by Algernon B. Reese, et al. of New York; and finally the last paper of the program (unfortunately, there were relatively few members left to hear the fine exposition) on "Factors influencing the blood volume of the choroid and retina," by Jerome W. Bettman and Victor G. Fellows, Jr., of San Francisco.

The scientific exhibits numbered 26 and, as usual, were an important part of the experience of the meeting. The prize exhibits pertaining to ophthalmology were: "Visual field interpretation" by David Harrington of San Francisco, first; "Precancerous and cancerous melanosis of the conjunctiva" by Algernon B. Reese and Bradley R. Straatsma of New York, second; and "The effect of glaucoma operations upon aqueous dynamics" by Peter C. Kronfeld and H. Isabelle McGarry of Chicago, third. These must have been difficult decisions for the judges of the exhibits to make because the other exhibits were of outstanding interest.

The Section on Instruction held 152 individual courses and 47 continuous ones. The faculty numbered 238 instructors and the hours of instruction totaled 403. Most of the courses were sold out early and all of them had exceptionally good attendance.

The usual social functions such as the banquet, the alumni dinners, and the Pan-American and other official cocktail parties, as well as private parties, occupied the evenings throughout the time of the meeting, and contributed very much indeed to the aura of friendly and compatible relationship among all of the members.

The officers for 1957 are as follows: President, Erling W. Hansen of Minneapolis, Minnesota; president-elect, LeRoy A. Schall of Boston; first vice-president, Louis H. Clerf of St. Petersburg, Florida; second vice-president, David O. Harrington of San Francisco; third vice-president, O. E. Van Alyea of Chicago. The new counselor is Col. Victor A. Byrnes, (MC), U.S.A.F.

The next meeting of the Academy will be held in Chicago the second week in October, 1957. The new candidates elected to membership numbered 236.

Besides the official business and program of the Academy, opportunity was taken of the nationwide attendance for committees of national and international importance to meet and to function. Among the newer ones of these are, The National Committee for Research in Ophthalmology and Blindness, and the Joint Committee on Eye Banks. A new organization called "The National Medical Foundation For Eye Care" under the presidency of Ralph O. Rychener of Memphis, Tennessee, was launched. Much more will be heard about these important organizations in the future.

Derrick Vail.

CORRESPONDENCE

Atypical accommodative esotropia

Editor,
American Journal of Ophthalmology:

In a recent paper on "Atypical accommodative esotropia," read before the Chicago Ophthalmological Society on May 16, 1955, and published in the June, 1956, issue of The American Journal of Ophthalmology, Dr. Martin J. Urist mentions the presence in some of his patients of that peculiar obliquity of the palpebral fissures which was found by me in cases where certain very definite disturbances of the vertical muscles exist. In this connection, he makes the following statement:

"Since this paper was written, Urrets-Zavalía has described the same condition. He describes the slant found in cases of bilateral depression in adduction as Mongoloid and that found in cases of bilateral elevation in adduction as anti-Mongoloid. He considers these deformities to be of a developmental character."

I am sure that Dr. Urist has never thought of questioning the priority of my own observations. Yet, I feel that his assertion might lead some to believe that, since the same were published by me at a time when he already had written—although not published nor otherwise divulged—a report on the subject, that priority could be maintained only in so far as publication, or presentation to a learned society, is concerned. (Incidentally, it must be remarked that this is the only accepted criterion on which priority claims can be based.) Therefore, I desire to point out a few facts which, I hope, will clarify the whole issue, avoid further misunderstandings, and establish beyond all reasonable doubt that Dr. Urist's first sentence should be reworded and say that the condition was described by me much before his paper was written.

1. The paper which was referred to by Dr. Urist in his presentation appeared in the January, 1955, issue of the *British Journal of Ophthalmology* and was received for publication on June 18, 1954, according to a footnote printed on the first page. This means that, in all probability, it was conceived and drawn upon before Dr. Urist wrote his, and at all events four months before his presentation to the Chicago Ophthalmological Society and 17 months before publication.

2. Even before this, another paper of mine, which dealt precisely with the "Occurrence of slight facial malformations in cases of strabismus," had been read in New York, in September, 1954, at the XVII International Congress of Ophthalmology. Dr. William L. Benedict acknowledged receipt of my manuscript in a letter dated

February 25, 1954, which proves that my paper had been written, at least partially, in the course of the year 1953. Besides, in the booklet containing the abstracts of the scientific papers to be presented at the congress, which was lavishly distributed, a comprehensive summary of mine was included.

3. Finally, I want to recall the fact that the same topic was brought by me to the attention of the Sociedad Colombiana de Oftalmología y Otorrinolaringología, in a lecture entitled "Importancia de las malformaciones faciales en los casos de estrabismo," delivered in Bogotá, by invitation, in August, 1953.

I do not suggest that either the last-mentioned paper or this lecture have had, in this respect, any influence on Dr. Urist's work, with which I am familiar (in fact, I believe that he was unaware of the existence of both), but I wish simply to make it plain that almost two years prior to his first public intimation that he had stumbled upon the same facts—or rather on some, of them, of which his few pertinent words offer but a glimpse—I had already been in the position of making my findings known in a coherent synthesis to my colleagues.

To this, I am going to add solely that it would have been desirable that Dr. Urist had mentioned my observations, and given them the credit they are due, in a more proper place, that is, not in small print, apropos of the description of his third clinical case, but in a discussion of the table in which he summarizes his, but largely my, conclusions. That his paper was written at the time mine reached his hands (which was before February 18, 1955, for by then he sent me a letter stating that he had "enjoyed my fine contribution") should not have prevented him from so doing, since an article by Brecher, Hartman, and Leonard which appeared in the February, 1955, issue of THE JOURNAL is adequately cited in the main part of his discourse.

And if I have said "largely my conclusions," it is because some of them are the ones just discussed and, again, because some had been made public by me eight or nine years ago. Thus, the fact that patients with bilateral elevation in adduction show a relative divergence of the visual axes in sursumversion and a convergence of the same in deorsumversion, and that those with bilateral depression in adduction exhibit the opposite phenomena (a fact which constitutes a most outstanding feature in Dr. Urist's work on strabismus, and which occupies a prominent place in his Table 2), was described and thoroughly accounted for by me from 1948 on in several papers, while the first mention of it ever made by Dr. Urist was in 1951. In this respect, it is interesting to note that in a paper on "The surgical treatment of esotropia with bilateral depression in adduction" that appeared in the May, 1956, issue of the *A.M.A. Archives of Ophthalmology*, and was recorded for publication on January 30, 1956, Dr. Urist turned his hand again to the subject, without even mentioning my previous investigations, to which his attention had already been alerted.

(Signed) Alberto Urrets-Zavalía, Jr.,
Cordoba, Argentina.

DR. URIST'S REPLY

Editor,
American Journal of Ophthalmology:

It is a pleasure to answer the letter of Dr. Urrets-Zavalia.

Concerning the peculiar obliquity of the palpebral fissures that he described so well and believed to be of congenital origin, all I did in my paper was stated the facts as they occurred. After I had my paper written I saw his fine article in the *British Journal of Ophthalmology* and quoted him in my paper. This, I thought, was sufficient to give him priority. I go on record that as far as I am concerned he has full priority and my congratulations for an excellent piece of work.

As to the last portion of the letter, this brings up a subject that has always troubled honest workers who do clinical research, namely, the vexing question of who saw and did what first. Disease processes and symptoms have been present in man since the dawn of antiquity. Many of these symptoms have been observed by thousands of people throughout the history of mankind. Does publication of a clinical finding in a medical journal place a copyright on the disease process? Dr. Urrets-Zavalía has indeed described the deviations he writes about in 1948. I was not aware of this work which was published in Spanish. But, more important, I must apologize to Dr. R. N. Berke for overlooking his work on the same subject which was published in 1947 in the *Archives of Ophthalmology*, volume 38, page 643. Dr. Berke stated:

"It is interesting to note that more than one-half the cases reported here were associated with an exotropia, which increased in eyes directed down and decreased in eyes directed up. If an esotropia was present, the esotropia decreased in eyes directed down. . . . It is interesting to recall that just the opposite occurs with bilateral overaction of the inferior oblique muscle; i.e., the esotropia becomes less in eyes directed upward and greater in eyes directed down."

What I attempted to do in 1951 was to show that most cases of horizontal squint with vertical deviations could be classified into four clinical entities. The classification was based on the relationship between the changes in the squint as the eyes were directed from side to side and up and down. The cover measurements were also of basic importance in my classification. Although many of these findings were seen and described by other workers in the field of ocular motility, I felt that the classification was original. But how can one be sure? In order to be sure that any work in clinical medicine is really new one would have to spend a life time in the library reading publications in all languages, including hieroglyphics, and would never get any work done or published.

(Signed) Martin J. Urist,
South Haven, Michigan.

BOOK REVIEWS

MEDICAL ASPECTS OF TRAFFIC ACCIDENTS. Edited by Harold Elliott, M.D., Montreal, Traffic Accident Foundation for Medical Research, 1955. 519 pages, index, general and chapter bibliographies. Price: $7.25.

In the 14 chapters of this volume nearly 100 contributors consider every phase of the subject. Pedestrians constitute two out of every three persons who die in traffic accidents. Perfect eyesight is no guarantee against accidents but visual acuity is one of the few visual factors susceptible of reliable measurement and there is a demonstrated relationship between visual acuity and depth perception.

R. G. C. Kelly referred to the instruments designed for comprehensive screening, such as the orthorater, sight screener, and telebinocular. Their reliability is dependent on the intelligence of the individual tested. "Since present knowledge and experience indicate that only visual acuity and fields of vision are of significance in the primary testing procedure, these instruments are unnecessarily complex and elaborate for the purpose."

John Nicholls suggested that the acuity of the private operator be 20/40 with both eyes and not less than 20/100 in the worse eye. The only other standard that he would now recommend is a horizontal visual field of 160 degrees.

Leon Brody noted that: "The probable importance of night vision is not matched by the reliability of available tests and, therefore, this function too must be put in the background,"—along with depth perception, ocular muscle balance, and color vision.

The Cambridge Research Unit reported that: "Visual alertness and concentration tend to inhibit normal blinking, which therefore would appear not to be a source of danger in driving unless something happens unexpectedly."

Paul Miles stressed the need of good peripheral vision: "Seldom is an object first discovered by the fovea. Its image first falls on peripheral retina, attracts attention by brightness, color, or movement, then stimulates fixation reflexes. . . . Visual reflexes are relatively slow. The simplest visual reflex in which a sudden peripheral stimulus starts an ocular fixation movement takes 0.15 second."

All agreed that periodic visual re-examinations should be done every three years.

James E. Lebensohn.

A Clinical Study of Concomitant Squint. By Léon Coppez. Bulletin de la Société belge d'ophtalmologie: Volume 112. Bruxelles Imprimerie médicale et scientifique, 67, Rue de l'orient. 120 pages. Price: Not listed.

The purpose of this monograph was to outline the dominant aspects of the symptomatic and surgical treatment of concomitant squint in a condensed form and to exclude the paralytic elements. Details of the anatomy and physiology of the ocular muscles are omitted as they were previously ably discussed by Weekers and Daenen. The study was, therefore, restricted to the essential facts of binocular vision, its disturbances and abnormalities, the methods of investigation and interpretation of findings. Only those techniques which were found adequate by personal experience are described. The plan and modes of investigation are chiefly presented in diagrams and tables. The favored surgical techniques are merely enumerated, as they were described in the report on paralytic squint in 1954.

The first section of the volume is devoted to diagnosis, a description of the different stages of examination, description of the instruments in use, the interpretation of findings, and a tentative classification of concomitant squint. A short survey of the etiology of concomitant strabismus is given in Chapter III and an equally short summary of heterophorias in Chapter VI. Chapters IV and V deal with procedures and the successive steps in the handling of individual cases, timing, choice of operation, and a short description of the preferred techniques.

The reasons for the good functional and cosmetic results in the early treatment of concomitant strabismus (that is before the age of six years) are analyzed. Special importance is given to the recognition and elimination of abnormal correspondence before a fixed, permanent pattern of binocular vision has been established. It is stressed that the prognosis depends to a great extent on this crucial point. The clear descriptions, exact deductions and conclusions, as well as the practical clinical approach to the subject give this manual the didactic value for which it was primarily written.

Alice R. Deutsch.

Myiasis des Auges: Medical and Entomologic Principles. By H. Krümmel and A. Brauns. Berlin, Duncker & Humlot, 1956. 66 pages, 16 illustrations, bibliography. Price: DM16.

Myiasis is the term applied to disturbances caused by larvae of flies in a living organism—man or vertebrates. The present monograph is the result of the combined efforts of an ophthalmologist and an entomologist.

In the first few chapters, ophthalmomyiasis is discussed with regard to clinical symptoms, diagnostic problems, and therapy. In their discussion, the authors follow Behr's classification into a relatively benign external and an almost always disastrous internal form. Histologic and clinical findings suggest that the larvae take a transscleral route into the subretinal space or the vitreous rather than a route via the anterior

chamber to produce the internal form. It is stressed that ophthalmomyiasis frequently is a complication of a nasal form, with migration of the larvae into the orbit via the sphenoidal fissures.

The second part of the volume deals with differential diagnosis of the larvae. Although it would be desirable to obtain a live larva and grow it into an imago, this is hardly ever feasible. There is a detailed description of the differential diagnosis of various species of larvae that should be of prime interest to the entomologist who, ideally, should co-operate with the ophthalmologist in evaluating every case of ophthalmomyiasis.

The authors are mostly interested in the larvae of flies common to Central Europe. They append a comprehensive bibliography that should prove invaluable to anyone interested in the subject.

Stefan Van Wien.

Biochemistry of the Eye. By Antoinette Pirie and Ruth van Heyningen, Springfield, Illinois, Charles C Thomas, 1956. 323 pages, index. Price: $7.00.

A new text on the biochemistry of the eye has been eagerly awaited by the English-speaking ophthalmologic world. Both the monograph by Arlington Krause and Volume I of Duke-Elder are over 20 years old and totally new concepts in theory and technology in biochemistry have arisen since then. Adler's remarkable text is of necessity limited and the recent monograph by J. Nordmann, *Le Biologie du Cristallin*, is at present unavailable in either English or French.

Pirie and van Heyningen have courageously abandoned the time-honored anterior to posterior approach and devote the first 50 percent of their text to their primary interest, the lens. As might be expected this section is superb. A chapter on the cornea follows next and, in discussing hydration and deturgescence, the authors obviously favor the "vital" theory of Maurice, et al. They heartlessly dismiss the basic investigation of Cogan and Kinsey into this subject in a short half paragraph. Sections on the retina, vitreous, and aqueous follow, all of which are excellent. The final chapter is entitled "The ocular effects of nutritional disease" and this is rather a hodge-podge of unrelated conditions all discussed rather briefly. It adds little to the book. The preceding 277 pages, however, deserve careful perusal. This book is highly recommended to all ophthalmologists and its inexpensive format puts it in the "must" class for all residents and students.

David Shoch.

The Hebrew Medical Journal, 1955. Volume 2. Edited By M. Einhorn, M.D., New York, N.Y.

This journal, now in its 28th year, is bilingual (Hebrew and English); and regularly features articles on the historic and social aspects of Jewish medicine. An article on the physician in Jewish law points out that the study of medicine enjoyed a religious sanction not granted to other secular branches of education. On the Sabbath the physician had the right to board a conveyance for visiting the sick, and medical books were exempted from the ban on reading secular literature on that day. The physician could also leave the house during the week of mourning to attend a patient. Jewish physicians in the 15th century were permitted to don the distinctive academic dress of the period, notwithstanding the general ban on adopting non-Jewish customs.

James E. Lebensohn.

ABSTRACT DEPARTMENT

EDITED BY DR. F. HERBERT HAESSLER

Abstracts are classified under the divisions listed below. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is mentioned only in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

1. Anatomy, embryology, and comparative ophthalmology
2. General pathology, bacteriology immunology
3. Vegetative physiology, biochemistry, pharmacology, toxicology
4. Physiologic optics, refraction, color vision
5. Diagnosis and therapy
6. Ocular motility
7. Conjunctiva, cornea, sclera
8. Uvea, sympathetic disease, aqueous
9. Glaucoma and ocular tension
10. Crystalline lens
11. Retina and vitreous
12. Optic nerve and chiasm
13. Neuro-ophthalmology
14. Eyeball, orbit, sinuses
15. Eyelids, lacrimal apparatus
16. Tumors
17. Injuries
18. Systemic disease and parasites
19. Congenital deformities heredity
20. Hygiene, sociology, education, and history

1

ANATOMY, EMBRYOLOGY, AND COMPARATIVE OPHTHALMOLOGY

François, J., Neetens, A. and Colette, J. M. **Vascularization of the optic pathway. IV. Optic tract and external geniculate body.** Brit. J. Ophth. **40**:341-354, June, 1956.

The cerebral hemispheres from 47 subjects over 45 years of age were examined and three separate techniques were employed: 1. dissection and macroscopic examination of the vascular system with or without injection of Neoprene latex after fixation in formalin, 2. stereoscopic examination of sections after injection of India ink, and 3. microradiographic study after injection with Thorotrast. The optic tract receives its supply from both the anterior choroidal and the posterior communicating arteries. A double vascularization due to the hairpin turns in the arterioles is noted in the interior of the optic tract. The external geniculate body is supplied to a lesser extent by the anterior choroidal artery and to a major extent by the posterior cerebral artery. (15 figures, 5 references) Lawrence L. Garner.

Wolter, J. Reimer. **Nerve bundles in the cornea of rabbits.** Klin. Monatsbl. f. Augenh. **129**:20-26, 1956.

The following groups can be distinguished: a. coarse fibers with dichotomic branching which are 5μ thick and straight, b. finer fibers with dichotomous branching which are about 2μ thick and run in arches and loops, and c. fine fibers which form a reticulum and are only 0.5μ thick. (6 figures, 6 references)

Frederick C. Blodi.

2

GENERAL PATHOLOGY, BACTERIOLOGY, IMMUNOLOGY

Appelmans, M., Michiels, J. and Misotten, L. **Experimental hyphema in the rabbit.** Bull. Soc. belge d'opht. **111**:413-420, Nov., 1955.

The surprising difference between a "hyphema" and the postsurgical accumulation of blood in the anterior chamber has been reported in a previous paper. It seemed interesting to continue this study by incising the eyes of a rabbit with a knife-needle and by injecting blood from the ear vein into the anterior chamber. The fate of an anterior chamber hemorrhage depends on the coagulation inside the anterior chamber. The rapid disap-

pearance of blood from the anterior chamber also depends on the dilution of blood by aqueous and not on lysis. Juxtalimbal diathermy of the inferior half of the eyeball impeded the resorption of the blood. (4 references) Alice R. Deutsch.

Heydenreich, A. **Regeneration of corneal stroma.** Klin. Monatsbl. f. Augenh. **129**:26-32, 1956.

If the corneal endothelium is severely damaged with an electric soldering iron a retrocorneal membrane may eventually form which has the same metachromatic staining properties as the corneal stroma. However, this membrane does not assume the true architectonic structure of the cornea and does not become transparent. (10 figures, 8 references)

Frederick C. Blodi.

Pau, Hans. **Reaction of corneal epithelium to injury.** Klin. Monatsbl. f. Augenh. **129**:33-38, 1956.

The author believes that the epithelial cells, as well as the stromal cells, may be transformed into leukocytes or lymphocytes. (9 figures, 11 references)

Frederick C. Blodi.

3

VEGETATIVE PHYSIOLOGY, BIOCHEMISTRY, PHARMACOLOGY, TOXICOLOGY

Appelmans, M., Michiels, J. and François, J. **New findings on diamox.** Bull. Soc. belge d'opht. **111**:338-346, Nov., 1955.

The hyperalbuminosis of the aqueous after the use of diamox was investigated in animal (rabbits) experiments and compared with the action of related chemical compounds like sulfanilamide and prontosil, and diuretics of the xanthine and mercurial groups.

The increased temporary protein content of the aqueous was found after the use of adequate and very high doses of diamox and after the use of other carbonic anhydrase inhibitors like sulfanilamide or prontosil but not with any other group of diuretics; no other drug caused a reduction of the ocular tension. When 3/10cm³ of diamox was injected subconjunctivally in five rabbits and when the anterior chamber was punctured after one-and-one half hours, the aqueous was found to be very rich in proteins. Nevertheless no decrease in ocular tension occured. The complexity in the action of diamox was emphasized and a vascular action considered possible. (2 figures, 10 references) Alice R. Deutsch.

Borello, Carlantonio. **Thromboplastic activity of the vitreous.** Rassegna ital. d'ottal. **25**:13-26, Jan.-Feb., 1956.

The human vitreous and that of other animals exerts a complex action upon blood coagulation. This extrinsic action causes an increase in the rapidity of coagulation, together with a restricted elasticity, thus favoring fibrinolysis. The ability to accelerate coagulation is more marked in the peripheral portion of the vitreous. The rabbit vitreous showed thromboplastic activity attributable to vitrein and protein. The varying effect upon coagulation of 1, blood and vitreous, 2, blood and normal saline and 3, entire blood is demonstrated. (4 figures, 2 tables, 35 references)

Eugene M. Blake.

Fukado, Y. **Phosphorous metabolism of the cornea as studied by P^{32}.** Acta Soc. Ophth. Japan **60**:617-621, July, 1956.

Radioactive phosphoric acid was injected into rabbits intraperitoneally. It took one hour until the blood level of inorganic phosphate reached the climax. It took five hours until the level of it reached the climax in the cornea and the greatest level in the cornea was about one half of that in the blood. It took four hours more until the organic phosphate reached its maximal concentration in the

cornea. Fukado thus shows that the phosphorus metabolism in the cornea is sluggish. (5 figures, 20 references)
Yukihiko Mitsui.

Huenemohr, Gisela. **The pH value of the cornea and its possible clinical importance.** Klin. Monatsbl. f. Augenh. **129**:38-44, 1956.

Colorimetric determinations were made. On hog's eyes it was found that the epithelium and the endothelium had a pH of 6.7, while the stroma had a pH of 8.0. The values were identical for human corneas of enucleated eyes. Lower values were usually found in eyes obtained at autopsy, especially when it is done some time after death or when a long coma preceded the death. This may be of some importance for corneal transplants and in a small series it could be shown that corneas obtained from donors who died suddenly had a much better chance to remain clear than corneas obtained from donors who died after a protracted illness. (1 figure, 2 tables, 17 references) Frederick C. Blodi.

de Laet, H. A. **The action of Manganocholine on the retinal arterial pressure.** Bull. Soc. belge d'opht. **111**:443-448, Nov., 1955.

Manganocholine Sapos, Pharma-products (Bruxelles) consists of two molecules of acetyl-choline and one molecule of MnCl 2. It is taken by mouth. Its action is slow because of a high molecular weight and gradual resorption. Its most pronounced effect is on the level of the arterioles.

Manganocholine was given to 19 hypertensive patients. It caused a decline of the minima and maxima of retinal arterial pressure and produced a marked fall of the index of rigidity; the improvement of headaches and dizziness was in accordance with the drop in the pressure. (1 table, 5 references) Alice R. Deutsch.

Langham, M. E. and Taylor, I. S. **Factors affecting the hydration of the cornea in the excised eye and the living animal.** Brit. J. Ophth. **40**:321-340, June, 1956.

Experiments in rabbits show the importance of aerobic metabolism in the normal state of deturgescence of the cornea. In the presence of oxygen the extent of corneal swelling was inverse to the decrease in temperature. Recovery of the cornea to normal could occur in the presence of oxygen but not in its absence. The use of metabolic depressants had no effect on corneal hydration, except for dinitrophenol which produced swelling in the excised cornea when administered in high concentrations. In low concentrations it stimulated respiration of the cornea and in higher concentrations depressed it. (4 figures, 8 tables, 37 references) Lawrence L. Garner.

Lieb, W. A. and Scherf, H. J. **Papaverine alkaloids and intraocular pressure.** Klin. Monatsbl. f. Augenh. **128**:686-705, 1956.

A number of alkaloids were tested on rabbits. The intraocular pressure was tested directly or indirectly. Among the nine opium alkaloids tested six (e.g. morphine) increased and three (e.g. codeine) decreased the pressure. Among the other alkaloids the effect varied. It is assumed that these results speak for a central (hypothalamic) regulation of the intraocular pressure. (17 figures, 4 tables, 38 references) Frederick C. Blodi.

Malanova, N. **The penetration of streptomycin in various ways of application and the influence of nicotinic acid on its action in the body.** Vestnik oftal. **4**:10-12, July-Aug., 1956.

Experiments were done on rabbits by introducing streptomycin intramuscularly, by retrobulbar and subconjunctival injection, and also by iontophoresis. The

concentration of streptomycin was measured in the aqueous, the vitreous and in the blood serum. The highest concentration of the drug was found to be in the aqueous with iontophoresis. It was lower with subconjunctival and retrobulbar injections and the lowest concentration of streptomycin in the eye was found after intramuscular injections. In the blood serum, the highest concentration of streptomycin was obtained after intramuscular injection.

Nicotinic acid was injected subcutaneously and it was established that it increased the activity of streptomycin in the fluids of the eye and in the blood serum. The concentration of the streptomycin in the urine showed that nicotinic acid slowed the elimination of streptomycin. The action of nicotinic acid on streptomycin in patients with ocular tuberculosis was similar to that in animals. Olga Sitchevska.

Morone, Giulio. **The use of lyophilized tissue in ophthalmology.** Rassegna ital. d'ottal. **25**:3-12, Jan.-Feb., 1956.

In these experiments the corneas of rabbits were removed immediately after death, placed in a jar and rapidly frozen by decompression, so that in the process of sublimation, the watery vapor, with P_2O_5 was removed. The jar is hermetically sealed and maintained on ice or at room temperature. After removal there is complete rejuvenation resulting in a clear cornea when placed in normal salt solution for 15 to 20 minutes. Histologically the only definite change was in the endothelium after 160 days. Metachromatic changes were present after a few hours in glycerine, especially in tissue preserved for long periods. This indicates a chromotropic power of the corneal cement substance. The results of the experiment shows that keratoplasties, lamellar or perforating, are very encouraging, especially in view of the difficulty in the reactivation of the tissue in the postoperative phase. (5 figures, 41 references) Eugene M. Blake.

Rossi, Antonio. **Prednisone and corneal injury.** Rassegna ital d'ottal. **24**:430-437, Nov.-Dec., 1955.

The comparative action of cortisone and of prednisone upon the reparation of aseptic corneal wounds in rabbits is discussed. The action of prednisone was compared with cortisone and prednisone with hydrocortone. Some eyes were removed on the third day, some on the seventh and some at the end of the eleventh. The inhibitory effect upon healing was the same whether cortisone or hydrocortone, or whether prednisone or prednisone was administered. The maximum inhibitory action was exhibited on the seventh day and affected the fibroblasts most markedly. (6 figures, 8 references) Eugene M. Blake.

Sattler, R. and Hussels, H. **Nebacetin in ophthalmology.** Klin. Monatsbl. f. Augenh. **128**:716-722, 1956.

Nebacetin is a mixture of neomycine and bacitracin. It is a synergistic mixture of two antibiotics which are usually used topically only. It was used prophylactically before intraocular operations. It proved to be superior to other antibiotics and sulfonamides. Resistant organisms were not encountered. This mixture is also of great value in treating eyes with acute external infections. (4 tables, 27 references) Frederick C. Blodi.

4

PHYSIOLOGIC OPTICS, REFRACTION, COLOR VISION

Ohno, S. **Measurement of the axial length of the eye by X ray and analysis of refraction.** Acta. Soc. Ophth. Japan **60**:460-481, June, 1956.

The antero-posterior diameter of the human eye was measured by X ray. In

the dark adapted eye, X ray causes a light sense. A narrow slit-beam of X ray is projected to the eye from the side. The beam is moved backwards. The point at which the light sense disappears indicates the layer of rods and cones at the posterior pole of the eyeball. The point corresponding to the corneal surface can be measured by another means. Thus the diameter length of the eyeball can be calculated. According to Ohno, the error of the measurement is very small as suggested by repeated measurement on successive days in some sample individuals. The measurement was performed in 495 high school students. The data thus obtained were comparatively studied with some other clinical data.

The author concludes that: 1. the axial length of the eyeball continues to increase during the highschool age period, while the lens continues to reduce the refractive power, and 2. the development of "school-myopia" is chiefly due to the lengthening of the axis of the eyeball rather than to an increase in the refractive power of the lens as suggested by Sato. (12 figures, 18 tables, 25 references)

Yukihiko Mitsui.

5

DIAGNOSIS AND THERAPY

Calligari, Giovanni. **Rectal anesthesia in ocular surgery in children.** Rassegna ital. d'ottal. **25**:65-71, Jan.-Feb., 1956.

For three years the author employed barbiturates by rectum for surgery in early life. Ninety-seven cases in children from six months to ten years of age are reported. The method of administration, its limitations and, above all, the advantages are stressed. Results are reported as 70 per cent optimal, 25 per cent good and 5 per cent unsatisfactory. (11 references)

Eugene M. Blake.

Coppez, Léon. **Enucleation with implant.** Bull. Soc. belge d'opht. **111**: 353-357, Nov., 1955.

The advantages and disadvantages of various modern integrated implants are discussed. Pertinent statistics from Moorfield's Hospital are reviewed which showed that after four years only 1 per cent of the tantalum-wired partially enclosed implants were still in place. Coppez prefers small acrylic implants with flat anterior surfaces and channels for the four rectus muscles. He is very particular in his technique for separation of the conjunctiva, the rectus muscles in their sheaths and tendons and the complete closure of the conjunctiva. The cosmetic results of his enucleations and implants are satisfactory because the motility of the artificial eyes has been improved and the deep disfiguring recession of the upper lids was favorably reduced.

Alice R. Deutsch.

François, J. and Verriest, G. **Campimetry in reduced illumination in vascular diseases of the retina.** Bull. Soc. belge d'opht. **111**:463-494, Nov., 1955.

The pathologic changes of the scotopic visual field in vascular retinal disease was investigated. Hypertensive, diabetic and leukemic retinopathy showed abnormalities at a time when the photopic fields were still normal. In thrombosis of a branch of the retinal vein scotopic campimetry revealed larger defects and allowed better topographic localization of the lesions. In prethrombosis the pericaecal scotoma and monocular enlargement of the "scotome central a l'obscur" were especially significant. The same was true for the visual field defects in early papilledema. The scotomas of retinal degenerations and central serous retinopathy also were much more pronounced than those charted during routine perimetric studies.

Attention was also called to the impaired adaptation curve of patients with

retinal vascular disease. (21 figures, 47 references) Alice R. Deutsch.

Gramberg-Danielsen, B. **Diseases of the cervical discs causing ocular affections.** Klin. Monatsbl. f. Augenh. **129**:13-20, 1956.

Two patients were observed in whom acute glaucoma and a retinal detachment followed a chiropractic maneuvre to the cervical spine. A number of other patients with eye diseases were then given a radiologic examination of the spine but no statistic correlation between diseases of the cervical spine and the eye could be found. (3 tables, 13 references) Frederick C. Blodi.

Guttner, Wladyslaw. **Application in ophthalmology of surgical diathermy with equipment made in Poland.** Klinika Oczna **25**:249-253, 1955.

The author describes a diathermy machine specially built for eye surgery. It was constructed according to the author's plans by the Polytechnical School in Warsaw. It was equipped with a light signal and a buzzer which indicated when the machine was sufficiently warmed and also with a timer for the duration of surgical procedure. This machine was used in five operations of retinal detachment and 19 cyclodiathermies. The results were comparable to any achieved with an accepted make of diathermy machine. (2 figures) Sylvan Brandon.

Heer, G. and Coda, G. **The pressure in the central retinal artery in the differential diagnosis of senile and arteriosclerotic dementia.** Rassegna ital. d'ottal. **25**:27-43, Jan.-Feb., 1956.

The authors investigated 20 patients with mental deterioration, studying the pressure in the central retinal artery by Bailliart's method. Blood Wassermann reaction, total cholesterol in the serum, ophthalmoscopic changes and the intraocular pressure were recorded. The test for syphilis was negative in all cases and the cholesterol was elevated in only 10. Ocular motility was normal and the photomotor reflex was torpid in nine patients. Signs of arteriosclerosis in the retina were more or less evident in all cases. The intraocular pressure varied within normal limits. Fifteen subjects showed arterial retinal hypotension in a mental state corresponding to terminal senile dementia, while the P.A.R. was diminished in the arteriosclerotic type. (15 references) Eugene M. Blake.

Hoorens, M. **Stereoscope, synoptophore or amblyoscope. Indications for the use of those instruments.** Bull. Soc. belge d'opht. **111**:358-364, Nov., 1955.

Stereoscopes and synoptophores are described and their particular applications and remedial indications are discussed.

The stereoscope is of great service in cases of divergent squint and in cases of previously convergent squints for the establishment of fusion ability and possibly depth perception. The synoptophore is the instrument of choice for patients with convergent squint of small residual post-surgical angle of squint and for cases of nearly corrected accommodative esotropia with mild residual esophoria. (4 figures) Alice R. Deutsch.

Huerkamp, B. **Diagnostic possibilities with infrared photography of corneal opacities.** Klin. Monatsbl. f. Augenh. **128**:667-672, 1956.

This type of photography is especially suitable for avascular scars. Reflection from the pigment epithelium of the iris will give a good picture of the pupil, synechiae and iris. Even vascularized scars may be penetrated by that method. If the iris is highly atrophic or absent no

pictures can be obtained. Dense blood pigmentation in the cornea also prevents the penetration of these rays. (6 figures, 2 references) Frederick C. Blodi.

Kizelman, Z. **The changes of the caliber of the retinal vessels in brain tumors.** Vestnik oftal. **3**:11-14, May-June, 1956.

Among 26 patients the diagnosis of brain tumor was confirmed by operations or by autopsy in 17 and the tumor was established by clinical methods in nine. The vision, the visual fields, the reaction of the pupils were noted and the caliber of the central retinal artery and vein was measured by means of a calibrometer which was designed by the author and has an optical system based on the heliometric principle which is used for astronomic measurements. In three-fourths of the patients with brain tumors a narrowing of the artery and dilatation of the vein far above normal was observed. In the initial stage of the brain tumor (with clear contours of the papilla) the range of the narrowing of the artery and dilatation of the vein is increased; the caliber of the artery was found to be narrowed on the average to 25 microns and that of the vein was dilated from 23 to 29 microns. There was also a difference of the caliber of the vessels in the right and left eye. The size of the asymmetry was on the average 10 microns in the artery and 18 in the vein. It was more marked on the side of the tumor. Long after the complete removal of the brain tumor the caliber of the retinal vessels returned to normal limits. (2 tables)

Olga Sitchevska.

de Laet, H. A. and Hubinant, P. O. **Changes in the retinal circulation during the Krasno-Ivy test.** Bull. Soc. belge d'opht. **111**:399-407, Nov., 1955.

The Krasno-Ivy test (K.I.T.) was published in 1950. It supposedly is a method of early detection of arteriolar spasm in hypertensive patients and patients with angina pectoris. The test consists in the charting of the critical fusion frequency before and after the sublingual application of 0.5 mg. of trinitrine. In the normal fundus the trinitrine causes a stasis which is followed by a lowered fusion frequency, whereas an increase demonstrates a spasm of the retinal artery and of the whole retinal network because trinitrine counteracts the retinal vascular spasm and increases the critical fusion frequency..

The authors used the test in different groups of patients but were especially interested in investigating the test in pregnant women in conjunction with the retinal and brachial blood pressures and the index of retinal rigidity. They found that there was a definite relationship between a positive K.I.T. (increase in the flicker fusion) and measurable arterial hypertony of the retina but that this procedure was valuable only when considered with other tests and that as a single test it was not reliable for prediction of pre-eclampsia. (1 figure, 2 tables, 13 references)

Alice R. Deutsch.

Mazzi, L. **Orientation in orbitography with contrast media.** Riv. oto-neuro-oftal. **30**:405-426, Sept.-Oct., 1955.

The author discusses in detail the technique of X-ray examination of the orbit by injecting a contrast medium into the retrobulbar spaces. Normal and pathological findings are described. (18 figures, 7 references) William C. Caccamise.

Mietke, H. and Schultze, J. **Color photography of the anterior segment of the eye.** Klin. Monatsbl. f. Augenh. **128**:706-710, 1956.

The author advises the so-called Kolpofot mechanism as used in gynecology. It takes advantage of a stroboscopic light. (9 figures, 9 references)

Frederick C. Blodi.

Orlowski, W. J., Rutkowski, S. and Niewiadomski, R. **The use of curare in ophthalmic surgery.** Klinika Oczna. **25**:261-266, 1955.

The authors used curare in 17 intraocular operations on young people. They feel that it should be used whenever the patient is tense and unruly. Only topical anesthesia was used and no injection of local anesthetics was necessary. The technique of giving curare is described. The method is considered safe when an experienced anesthetist is present. The behavior of the intraocular pressure was followed and it was found that in glaucoma the pressure dropped as much as 20 to 40 mm. Hg after curarization. In eyes with normal tension, changes in pressure were only 2 to 6 mm. Hg. (2 figures, 7 references) Sylvan Brandon.

Rossi, A. and Pettinati, S. **Beta-ray therapy in ophthalmology.** Rassegna ital. d'ottal. **24**:438-456, Nov.-Dec., 1955.

The authors present an excellent discussion of the action of the various forms of radiation available; these include the alpha, beta, and gamma rays. The precautions in the use of radium and the therapeutic effect of beta rays on the anterior portion of the eye are pointed out. While enthusiastically recommending this form of therapy they point out its limitations. They present the physics of radiation in considerable detail. (20 references)
Eugene M. Blake.

Rössler, Hubert. **Treatment of herpes zoster.** Klin. Monatsbl. f. Augenh. **128**: 727-730, 1956.

Aureomycin was given internally in 16 cases of herpes zoster. Vitamine B_1 and B_{12} and Irgapyrin were injected. Twelve patients could be re-examined, only two had permanent ocular changes which reduced vision in one eye to counting fingers at two feet. The other eye was blind. (10 references) Frederick C. Blodi.

Smith, Redmond. **Blood in the canal of Schlemm.** Brit. J. Ophth. **40**:358-365, June, 1956.

A series of eyes of patients with simple glaucoma and of normal subjects was studied with the help of a modified Goldmann gonioscopic lens. Unless the lens is modified by placing a small elevated rim along its ridge, this examination fails to reveal any significant changes, which shows that the modification is extremely important. The study reveals that filling of the canal of Schlemm with blood is seen more often in the nonglaucomatous patient. Old age and elevation of tension also effect the inhibition of filling of the canal of Schlemm. The possible use of this finding as a diagnostic help is discussed, despite its limitations. A more refined technique of testing is definitely necessary. (2 figures, 7 tables, 5 references) Lawrence L. Garner.

6

OCULAR MOTILITY

De Jaeger, A. and Bernolet, J. **The psycho-psychological problems in strabismus and amblyopias.** Bull. Soc., belge d'opht. **111**:369-381, Nov., 1955.

The physiology of the nervous system and the phylogenetic and ontogenetic factors in the development of the visual functions are reviewed. Strabismus is considered to be the result of an abnormal maturation. As soon as a development towards strabismus is noticed every effort should be made to find the cause and to counteract it. When the foveolar function is impaired the vision of this eye should be strengthened; when deviation already has occurred this deviation should be corrected. Early establishment of a normal relationship of both eyes in single binocular vision is of utmost importance. The details and the particular favorable circumstances for successful treatment of these anomalies should be investigated

early in childhood and interfering conditions should be eliminated in time. (7 references) Alice R. Deutsch.

Krewson, William E. **Head tilting in the diagnosis of ocular muscle disturbances.** Internatl. Coll. Surg. J. **25**:590-594, May, 1956.

Paresis of a horizontally-acting muscle usually causes a turning of the face to the side of the affected muscle. In the case of the vertically-acting muscles in general the chin is elevated with paralysis of the elevators and depressed with paralysis of the depressors. Tipping of the head to the nonparalyzed side is usually the result of a superior oblique palsy. Ocular torticollis may be differentiated from ordinary torticollis by the absence of contractures and the fact that the head is fully moveable. Generally the head is tilted to avoid diplopia, and this indicates that binocular vision is present or has been present and can be reestablished with proper surgery. This article is an excellent summary of the subject of head tilting. David Shoch.

Misotten, R. and Nelis, J. **Juxta-foveal fixation in concomitant squint.** Bull. Soc. belge d'opht. **111**:364-369, Nov., 1955.

In any form of concomitant squint the mode of fixation is very important. The significance of Bielschowsky's after-image test in alternators and amblyopes with foveal fixation was ascertained. The faulty results with this test in amblyopes with extrafoveal fixation are demonstrated. Some newer methods of examination which avoided the errors of the older techniques are described. The pattern of fixation in 140 patients with squints was recorded. Twenty-six were alternators, 114 had monocular squint, and among these 59 had no foveal fixation. (2 figures) Alice R. Deutsch.

Norbis, A. L. and Malbran, E. **Concomitant esotropia of late onset. Pathological report of four cases in siblings.** Brit. J. Ophth. **40**:373-380, June, 1956.

Four cases of esotropia in one family having an onset at six years of age in three of the children and near nine years in the other is indeed a rare finding. Most of these cases occur before the age of five years. The hereditary factors are discussed and the surgical treatment and the results are described. (1 figure, 45 references) Lawrence L. Garner.

Sachsenweger, R. **Lantern slides and movies in conservative strabismus therapy.** Klin. Monatsbl. f. Augenh. **129**:96-98, 1956.

Both of these accessory devices help in the visual training. (4 references) Frederick C. Blodi.

7

CONJUNCTIVA, CORNEA, SCLERA

Bochkariova, A. **The neuro-pathologic changes of the cornea in iridocyclitis and glaucoma.** Vestnik oftal. **3**:7-10, May-June, 1956.

The author reviews the literature and describes the innervation of the normal cornea in six normal enucleated eyes, eight eyes enucleated because of absolute glaucoma, and 24 eyes enucleated after traumatic iridocyclitis, all of which were studied histologically after impregnation with gold by the method of Bielschowsky-Gross and staining with hematoxylin. The nervous elements of the injured corneas and also of the uninjured cornea of eyes with a wound in the sclera were studied. The eyes were enucleated from three to four weeks after the injury. It was found that the destructive changes of the nervous elements of the cornea are similar after glaucoma and traumatic iridocyclitis. Dystrophy and increased growth of the nervous elements was observed and dystrophy was predominant in the medul-

lated nerve fibers. The receptors, which are represented by the branching nerve fibers and ball-like formation, are more stable and only the initial form of dystrophic argentophylia was noted. Unchanged nerve fibers were also present. This is observed more often in iridocyclitis than in glaucoma. Dystrophy and excessive growth of nervous fibers is more marked in absolute glaucoma, which is explained by the severe clinical dystrophy of the cornea. (6 photomicrographs)

Olga Sitchevska.

Boros, B. and Takats, I. **Examination of the acetylcholin content of corneal grafts.** Szemeszet **2**:49-56, 1956.

In experiments with 30 rabbits, the authors found marked differences between the acetylcholin content of clear and of clouded grafts, though morphologically no difference in innervation was present in the grafts of identical age. Acetylcholin synthesis is considerably impaired in the grafts undergoing turbidity. By demonstrating the quantitative changes of acetylcholin, the authors have pointed to one of the hitherto unknown factors of clouded corneal grafts. Gyula Lugossy.

Braley, Alson E. **Red eye.** Mississippi Doctor **33**:325-331, May, 1956.

Braley discusses the red eye under three chief headings: the bacterial, the viral, and the allergic conjunctivitides. The character of the invading organism in the bacterial group has been changing recently from the gram positive cocci to the gram negative rods. The usual response is a papillary hypertrophy. Gonorrheal ophthalmia has become rather rare in the U.S. and England. Braley feels that the time-honored silver nitrate prophylaxis of new born babies' eyes should be abandoned and replaced by the use of one of the wide-spectrum antibiotics.

Viral conjunctivitis is usually resistant to antibiotics except for trachoma and inclusion conjunctivitis. Other viral conjunctivitides discussed are epidemic keratoconjunctivitis, APC virus, certain infections, cat scratch fever, vaccinia and Newcastle's disease. The usual response is a follicular hypertrophy.

Allergic conjunctivitis may be an immediate response to inhalants or food or a chronic affection, either atopic in nature or a delayed bacterial type. Phlyctenular keratoconjunctivitis is an example of the latter group. The most effective therapeutic agent in these allergic "red-eyes" is apparently hydrocortisone. (50 references) David Shoch.

Casanovas, J. and Camins, J. **The clinical aspects of the present epidemic of keratoconjunctivitis.** Arch. Soc. oftal. hispano-am. **16**:131-155, Feb., 1956.

This is a report of the first serious epidemic of more than one thousand cases of this disease in Barcelona, Spain. It began in August, 1954, reached its maximum in December, subsided, and then reached another peak in July, 1955. It affected principally the workers of the metallurgical industries, following promptly upon slight trauma such as that which is caused by conjunctival or corneal foreign bodies. It was consequently encountered predominantly in males. In the cases seen at the dispensaries, there was no difference as to sex or age, children, three years of age, being among the patients. In young children the disease had less tendency to involve the cornea, which, on the whole, was involved in 40 percent of the cases. The disease lasted 40 days in the traumatic cases, and 25 in the others. The conjunctivitis was usually bilateral, running a milder course in the second eye. Visual acuity was markedly reduced, but always returned to normal, even in cases in which corneal opacities persisted for months. Corneal hypoesthesia was found in 90 percent of the cases. The sedimentation

rate and the leucocytic formula investigated in 12 cases, showed a high sedimentation rate, and predominance of lymphocytes. The conjunctival secretion contained a marked predominance of mononuclear cells, with an absence of or an indifferent conjunctival flora. The literature is thoroughly reviewed and the author discusses the controversial question of the relation of trauma to the infection. He concludes that where there is a history of trauma it is difficult to deny its etiologic importance. (2 figures, 199 references) Ray K. Daily.

Cascio, Giuseppe. **Bowen's disease of the conjunctiva.** Rassegna ital. d'ottal. **25**:44-54, Jan.-Feb., 1956.

This man, 55 years of age, attributed the growth upon his eye to minor trauma which preceded the lesion by two months. The growth was rapid, measured 8 mm. in diameter, arose from the conjunctiva, and overlapped the limbus. It was of waxy appearance, lobulated and not visibly vascularized. The mass was removed under cocaine anesthesia. Microscopic study showed a sudden alteration of the epithelium which did not break through the basal membrane. At times the cells formed pseudofibrils. Vacuoles were present in some cells and some cells were multinucleated. Pearls were noted and the typical degenerative changes of Bowen's disease were evident. The disease was not malignant and did not recur after removal. (9 figures, 17 references) Eugene M. Blake.

Cockburn, T. A., Rowe, W. P. and Huebner, R. J. **Outbreak of conjunctivitis and pharyngitis to type 3 APC virus infection.** Am. J. Hyg. **63**:250-253, May, 1956.

In 1951 an epidemic of "Greeley disease" occurred in Greeley, Colorado. This was characterized by conjunctivitis and pharyngitis. Fortunately serum drawn from 11 cases had been frozen, and in 1955 studies were made by the author on these sera to see if the 1951 outbreak could have been the recently described pharyngo-conjunctival fever caused by type 3 APC virus. Of the 11 cases, 10 demonstrated a rise in complement fixing antibody titer, and eight also had a rise in neutralizing antibody titer to type 3 APC virus. This serologic evidence plus the similar clinical characteristics lead the authors to conclude that the "Greeley" outbreak was due to type 3 APC virus. (1 table, 11 references) David Shoch.

Eguchi, K. **Studies of keratitis superficialis diffusa, an epithelial keratopathy in Japan. II.** Acta Soc. Ophth. Japan **60**: 597-616, July, 1956.

The diffuse superficial keratitis which is characterized by minute punctate erosions of the cornea, is a condition frequently found in Japan and has been considered to be caused by a deficiency in vitamin B_2. Eguchi confirmed this fact by a vitamin determination in the blood of such patients. The concentration of vitamin B_2 in the blood averaged 9 gamma percent in normal individuals and 90 percent of the vitamin was in the ester form. It averaged 7 gamma percent in patients' blood and 80 percent of the vitamin was in the ester form. Most patients responded well to a treatment with this vitamin. However, there were still some case of this condition having no relation to the vitamin deficiency. The author also describes a few cases of the sicca syndrome in Japan. (14 figures, 6 tables, 46 references) Yukihiko Mitsui.

Friede, Reinhard. **Surgery of chronic corneal diseases.** Klin. Monatsbl. f. Augenh. **129**:56-61, 1956.

In chronic inflammation and ulcer of the cornea the author advises excising the affected area with a trephine. The ex-

cision should go down to Descemet's membrane but not beyond it.

Frederick C. Blodi.

Kahan, A., Szeghy, G. and Vajda, P. **Virus agglutination (Hirst phenomenon) with trachoma wash-water.** Szemeszet **2**:56-60, 1956.

The results of 1,000 examinations are reported. Irrigation fluid and tears from glaucomatous eyes cause agglutination in suspensions of chicken erythrocytes. The phenomenon is essentially due to the so-called Hirst's virus agglutination. The protamin agglutination of erythrocyte suspensions is inhibited by normal tears and trachoma is characterized by the decrease of this inhibition.

Gyula Lugossy.

Kurz, Jaromir. **Corneal suture.** Klinika Oczna **25**:225-234, 1955.

Corneal sutures are frequently necessary treatment of corneal wounds, but when the wound is linear, placement of the suture through the sclera across the cornea and perpendicular to the axis of the wound approximates the corneal edges and permits healing. There is less scar tissue when sutures in the cornea proper can be avoided. Corneal sutures, even when correctly placed, leave the posterior part of the wound gaping, with subsequent formation of scar tissue in that area and possibly anterior synechiae. In the author's opinion, the best suture is a double mattress suture which can be placed with three needles on the same thread. (8 figures, 11 references)

Sylvan Brandon.

Kuwahara, Y. **Experimental keratoplasty with acrylic implant. V.** Acta Soc. Ophth. Japan **60**:589-597, July, 1956.

The author introduces a new acrylic implant for keratoplasty which has a vinyl wing. The cornea is first separated into two layers by sharp scissors inserted from the upper limbus. Then the central portion of the cornea is removed by a trephine for insertion of the implant. The vinyl wing is inserted between the two separated layers of the cornea. A good result was obtained in 6 of the 16 rabbits. (13 figures, 2 tables, 15 references)

Yukihiko Mitsui.

Meyer-Schwickerath, G. and Grueterich, E. **Band keratopathy in disturbances of the calcium metabolism.** Klin. Monatsbl. f. Augenh. **129**:44-56, 1956.

A bilateral band keratopathy was found in a two and one half-year-old boy with chronic, idiopathic hypercalcemia. There was an extensive calcification of the bones and calcium deposits were present in the kidneys. The condition improved with a low calcium diet. (5 figures, 25 references)

Frederick C. Blodi.

Motina, M. **Electrophoresis of penicillin in the therapy of purulent ulcers of the cornea.** Vestnik oftal. **3**:28-30, May-June, 1956.

Motina describes the procedure used in 61 patients. Of these 92 percent had hypopyon keratitis, in 54 patients the etiology was trauma and in 20 patients the ulcer was located in the center. Pneumococci were found in 27 patients, staphylococci in 18, mixed infection in six; in 10 no microbes were found.

The pain decreased or ceased in all patients in 24 to 48 hours. The ulcers were clearing and epithelization was complete from 24 hours to four days. The pneumococci disappeared in 24 to 48 hours, the staphylococci from two to four days. The hypopyon was absorbed in from two to four days. The average time of treatment was eight or nine days. The electrophoresis of penicillin shortens the course of treatment and increases the visual acuity in hypopyon keratitis as compared with the usual methods of treatment. (1 table)

Olga Sitchevska.

Oguchi, M., Kawase, S., Yoshinaga, S., Migita, S. and Nemoto, T. **Statistical study of vernal conjunctivitis.** Acta Soc. Ophth. Japan **60**:517-528. July, 1956.

In this statistical study of 666 cases of vernal conjunctivitis it was found that the patients were 0.3 percent of the outpatients and the disease occurred twice as often in the male as in the female. The onset of the disease most frequently occurs between the age of 11 and 20 years. The season of frequent outbreaks coincides with that of abundant pollen. A familial occurrence is not uncommon. An acute form of this condition is frequently seen and an acute condition is apt to be cured in one month. (5 figures, 14 tables) Yukihiko Mitsui.

Olah, I. **Changes of corneal sensitivity in trachoma.** Szemeszet **2**:79-82, 1956.

In 200 trachoma patients correlation was found between pannus, granulation and vascularization, and reduced sensitivity of the cornea. This reduction of sensitivity persists after clinical recovery. Gyula Lugossy.

Pagani, Luciano, **Cicatricial granuloma of the conjunctiva simulating a blood cyst.** Rassegna ital. d'ottal. **25**:55-64, Jan.-Feb., 1956.

After enucleation of the eye because of hemorrhagic glaucoma and implantation of a glass ball, a dark red rounded mass of firm consistency developed. This mass was removed and histologic study showed it to be largely granulation tissue with many newformed vessels. The diagnosis was chronic inflammatory granuloma. (5 figures, 20 references) Eugene M. Blake.

Pallares, J. **A case of ligneous conjunctivitis.** Arch. Soc. oftal. hispano-am. **16**:156-162, Feb., 1956.

Pallares reports a case of this rare disease. The affection began in a ten-day-old child as a bilateral conjunctivitis, which in a few days became pseudomembranous. It became chronic, with acute exacerbations and relative remissions, and gradually developed a marked induration of the lids, without any improvement or with aggravation of symptoms in response to argyrol, mercurochrome, penicillin, aureomycin, albucide, methylene blue, diphtheria antitoxin, silver nitrate applications, removal of the membrane, ointments of vitamin A and terramycin, the internal administration of sulfa drugs, and injections of penicillin. The corneas were not involved during the three months during which the author had the child under observation. Smears were negative for bacteria or inclusion bodies. Only staphylococcus albus grew on culture. Histologically the pseudomembrane consisted of epithelial remains and amorphous and hyaline masses invaded by purulent elements, without fibrin. The characteristic symptom of this lesion is the hard woody induration of the lids which develops as the process progresses. It involves the subconjunctival tissue which becomes transformed into a fibrous mass. Paufique and Moreau, who added three cases to the 15 reported in the literature, found excision of the hard mass and betatherapy to be the most effective treatment for this disease. Corneal involvement is not constant, and when it occurs, may lead to corneal perforation. (1 figure) Ray K. Daily.

Szeghy, G., Kahan, A. and Vajda, P. **Trachoma and blood clotting.** Szemeszet **2**:60-65, 1956.

Softened trachoma nodules contain a very large amount of thrombokinase as compared with the thrombokinase content of another lymphocytic tissue, the tonsil, and it can be dissolved out of the trachoma cells. Owing to their greater thrombin content, trachoma tears and irrigation fluid promote blood clotting.

Normal tears and irrigation fluid contain more of the substance which neutralizes heparin than trachoma tears. The antiheparine action of tears may be explained by its lysozyme content.

Gyula Lugossy.

Vajda, P., Kahan, A. and Szeghy, G. **Trachoma and fibrinolysis.** Szemeszet **2**:65-67, 1956.

The following results were obtained from 400 examinations: 1. trachomatous tears or irrigation fluid contain an enzyme which dissolves fibrin, 2. the nature of this enzyme is like that of kathepsin III, 3. the enzyme is derived from disintegrating lymphocytes, and 4. kathepsin may be credited with a virus-neutralizing effect. Gyula Lugossy.

8

UVEA, SYMPATHETIC DISEASE, AQUEOUS

Cortes, Hernan. **A case of melanoma of the choroid.** Arch. Soc. oftal. hispano-am. **16**:171-178, Feb., 1956.

The left eye of a 56-year-old man was enucleated with the diagnosis of an intraocular neoplasm. At operation the tumor was found to have invaded the sclera and epibulbar tissue. The orbital tissue contiguous to the scleral invasion of the tumor was coagulated, and the orbit subsequently treated with radium. The histopathologic diagnosis was a mixed type malignant melanoma of the choroid with epibulbar extension. (3 figures, 4 references) Ray K. Daily.

François, J. and Neetens, A. **Spontaneous regression of rubeosis iridis.** Bull. belge d'opht. **111**:318-327, Nov., 1955.

Three cases of spontaneous regression of rubeosis iridis and improvement of the accompanying ocular hypertension are discussed in detail. It was shown that the secondary glaucoma in rubeosis iridis was caused by an increase in the resistance to the outflow of aqueous, which in turn was dependent on neovascularization in the chamber angle. The successive interrelated stages in the disappearance of the iris vessels and the final vanishing of the vascular loops in the chamber angle and their relation to isolated remaining vessels and pigment remnants are described. As soon as the chamber angle was cleared of new-formed vessels the resistance to the outflow of aqueous receded and the ocular tension became normal. The mechanism of the spontaneous regression of the iris vessels could not be explained. Because of the generally poor prognosis of rubeosis iridis this unusual experience seemed to be especially interesting. (7 figures, 5 references)

Alice R. Deutsch.

Krahnstöver, Max. **Ankylopoetic spondylarthritis and iritis.** Klin Monatsbl. f. Augenh. **128**:722-724, 1956.

Among 12 patients was one who had had an optic neuritis eight years prior to the iritis. A pair of identical twins was also in this series. (13 references)

Frederick C. Blodi.

9

GLAUCOMA AND OCULAR TENSION

Alimudden, M. **Normal intra-ocular pressure.** Brit. J. Ophth. **40**:366-372, June, 1956.

Tonometric studies were made on the eyes of 1100 normal Pakistanni subjects at six-hour intervals for two days to obtain a mean reading. The average tension was found to be 19 mm. Hg; a slight tension increase was noted with advance in years, especially in women. A slightly higher reading in the left eye was noted and may be explained by the more direct circulation to this eye. 96 percent of the patients showed a diurnal variation up to 3 mm. Hg and 4 percent up to 5 mm. Hg. The jugular compression test was not

found very useful whereas 12 percent of the subjects showed a rise of seven to 10 mm. Hg in the water drinking test and 88 percent a rise of two to six mm. Hg. (2 figures, 7 tables, 25 references)

Lawrence L. Garner.

Biro, I. **New observations on the familial occurrence of glaucoma.** Szemeszet **2**:67-72, 1956.

Data pertinent to familial relationships of glaucoma have been collected by the author for 20 years. In this paper three independent situations are reported, from which a peculiar conversion of certain glaucoma patterns may be concluded. If the character of glaucoma changes, exogenous factors and conditions as well as endogenous ones should be taken into consideration. Gyula Lugossy.

Brooser, G. **Effect of ACTH upon ocular tension.** Szemeszet **2**:75-79, 1956.

The daily fluctuations of tension were recorded in four sexually mature rabbits for one week. In the second week, they were given three units of cortorphine per kg. intramuscularly. Slight increase of tension was noted. After an interval of one week the dose of six units per kg. resulted in a considerable and constant elevation of tension. In agreement with Salzmann, Pillat, and Powers, the author is of the opinion that eye tension is raised by ACTH. Gyula Lugossy.

Delage, J. M., Audet, J. and Pichette, H. **Blood coagulation and glaucoma.** Union Med. Canada **85**:525-528, May, 1956.

The authors tested the coagulability of the blood in a group of patients with chronic glaucoma (27 determinations) and in a group with acute glaucoma (16 determinations). Some patients apparently fell into both groups, and several times more than one determination was done on a given patient. Therefore the total number of patients is smaller than the above figures indicate. The authors used the *in vitro* tolerance to heparin test. Their results indicate that there is a hypercoagulability of the blood in chronic glaucoma and a hypocoagulability in acute crises and on recovery from acute crises. The authors have not attempted to elucidate the site of this alteration in the mechanism of blood coagulation except that in an occasional case the prothrombin levels have been normal. (2 tables, 5 references) David Shoch.

François, J., Rabaey, M. and Neetens, A. **Perfusion of ten glaucomatous eyes.** Bull. Soc. belge d'opht. **111**:426-443, Nov., 1955.

Six eyes with simple glaucoma, one eye with a narrow angle glaucoma and one eye with secondary glaucoma were perfused immediately after enucleation. The perfusion fluid consisted of 3 cc. KH_2PO_4 M/15 and 7 cc. NaH_2PO_4 M/15 and had a pH of 7. Two parts of the perfusion liquid were added to one part of India ink. Whenever the resistance to the outflow of aqueous was normal the trabeculum was normal also. The resistance to the outflow of aqueous proved to be stable and high in open angle glaucoma. There was also an increased resistance in the perfusion tests because of collagen and elastic fiber changes deep in the trabeculae. The perfusion tests revealed variations in the resistance to the outflow of aqueous in narrow angle glaucoma. These experiments also demonstrated the importance of the chamber depth for the outflow of the aqueous independent of circulatory and nervous factors. The perfect concordance of the clinical findings in tonography and the findings in these perfusion studies are another proof of the significance of the resistance to the outflow of the aqueous in the evaluation of

a case of glaucoma. The morphologic changes in the chamber angle visible in pathologic specimens were confirmed by tracing the India ink on its path through the trabeculae. (17 figures, 1 reference)

Alice R. Deutsch.

Funder, Wolfgang. **Quadrant cyclodiathermy as a primary operation.** Klin. Monatsbl. f. Augenh. **129**:73-78, 1956.

One quadrant (usually the lower nasal) is treated. The conjunctiva is dissected and the diathermy applications are made with a one mm. needle, four mm. away from the limbus. Four or five coagulations are applied for three to six seconds each. A paracentesis usually follows. In 19 of 43 eyes the pressure could not be controlled; in 12 eyes a second operation was done and here cyclodiathermy in another quadrant was more effective than any other operation. No complications were noted. (3 tables, 14 references)

Frederick C. Blodi.

Gauly, Edward. **A modified cyclodialysis with a filtering cleft.** Klin. Monatsbl. f. Augenh. **129**:67-72, 1956.

The author makes a T-shaped incision in the sclera which becomes a filtering scar. A special spatula (separator) is introduced which allows a slow decompression of the eye. Good results were obtained in 25 patients. (3 figures, 7 references)

Frederick C. Blodi.

Kluyskens, M. J. **Incomplete late congenital glaucoma; retinal detachment after iridencleisis.** Bull. Soc. belge d'opht. **111**:328-337, Nov., 1955.

A 59-year-old woman with bilateral megalocornea developed glaucoma in her left eye when she was 50 years old and in spite of a tension-reducing operation she became blind in this eye. When she was 59 years old the tension increased in her right eye. A subsequent iridencleisis was followed by a retinal detachment. This detachment subsided temporarily after treatment by rest but recurred after six months; a retinal tear surrounded by heaped up pigment was easily visible and considered to be a place of vitreous-retinal adhesions. Some ciliary processes were seen to be wedged into the scleral scar. The traction of these enclosed ciliary processes, the degeneration of the peripheral retina with vitreous adhesions and the capillary hyperemia of the uvea during the postsurgical hypotensive phase probably favored the rapid formation of the subretinal exudate. The various manifestations of complete and incomplete congenital glaucoma and the most fundamental anatomic deviations in the chamber angle are reviewed to provide an explanation of this unusual case. (10 figures)

Alice R. Deutsch.

Krieger, H. P. and Feigen, I. **Transient glaucoma in viral encephalitis with diencephalic lesions.** Neurology **6**:518-522, July, 1956.

The authors describe a patient who suffered an attack of acute closed angle glaucoma during the course of a viral encephalitis. Autopsy findings included numerous lesions of the diencephalon and the authors suggest that these lesions were the cause of the acute glaucoma. The acute episode persisted for three days despite the use of miotics, and after this time the tension gradually fell to normal. The authors feel that their thesis is supported by the work of von Sallmann and Magitot on the relationship of the diencephalon to glaucoma. Unfortunately the eyes were not obtained at autopsy. (10 references)

David Shoch.

Leydhecker, W. and Leydhecker, G. **Measurement of ocular rigidity and the Schiøtz scale of 1954.** Klin. Monatsbl. f. Augenh. **129**:61-67, 1956.

In a large series of eyes the ocular tension was measured with various weights. In normal eyes the pressure found with the 10.0 gm. weight should be 2.8 mm. higher than the pressure found with the 5.5 gm. weight. If the pressure found with the 10.0 gm. weight is equal, lower or more than 2.8 mm. higher than the pressure found with the 5.5 weight, the ocular rigidity must be abnormal. This difference is higher for glaucomatous eyes. The conversion table for the 10.0 gm. and 7.5 gm. weight were found to be 3 mm. too high for readings up to 3.5 on the scale of the tonometer. (10 references)

Frederick C. Blodi.

Prijot, E. and Lavergne, G. **A tonographic study on diamox.** Bull. Soc. belge d'opht. **111**:346-353, Nov., 1955.

The effects of diamox on the dynamics of the aqueous were investigated. In contradistinction to similar experiments by B. Becker, who measured the resistance to the outflow of aqueous six hours after a single dose of 250 mg. diamox, the resistance to the outflow of aqueous in this experiment was determined two hours after the intake of 250 mg. of diamox. At this period the ocular tension was considered to be in a perfect equilibrium especially if diamox had been given around the clock for the preceding 24 hours. A significant increase in the resistance to the outflow of the aqueous was found. It amounted to about 18 percent. The effects of homeostatic phenomena on the regulation of the ocular tension are discussed. (1 table, 10 references)

Alice R. Deutsch.

Provotorova, L. **Gonioscopy in glaucoma.** Vestnik oftal. **3**:3-7, May-June, 1956.

It was found that the angle is open in nearly all the cases of simple glaucoma. In inflammatory glaucoma the angle is open in about half of the eyes examined. In eyes with simple glaucoma gonioscopy shows the following basic changes: peripheral, small, single synechiae and pigmentation of the iris processes and of the corneoscleral trabeculae of Schlemm's canal, which is moderate. In inflammatory glaucoma the synechiae are more numerous and thicker than in simple glaucoma. The pigmentation of the corneoscleral trabeculae of Schlemm's canal is more pronounced and increases with the progress of the glaucomatous process. During an accute attack of glaucoma the angle closes; if the attack is aborted the angle can be opened. It is impossible to judge whether the eye is predisposed to glaucoma from the size of the angle. Peripheral synechiae in patients with suspected glaucoma make a diagnosis of the initial form of glaucoma more probable. Gonioscopy is a valuable diagnostic method in establishing the presence of glaucoma.

Olga Sitchevska.

Vannini, Angelo. **Gonioscopy in the iridencleisis operation.** Rassegna ital. d'ottal. **24**:410-415, Nov.-Dec., 1955.

The author presents the divergent opinions of various writers on the changes observed with the goniolens after the operation of iris inclusion. He observed that directly lateral to the zone of operation the iridocorneal angle is blocked by iris to a greater or less extent. In the remaining sectors, not directly concerned with the wound, the angle is occupied by a variable number of synechiae. These were demonstrated to be more numerous after operation than before. In an acute attack in which it has been possible to examine gonioscopically before operation and afterwards, the anterior chamber is freer before operation than after. Pigmentation of the angle is increased postoperatively, depending somewhat on the age of the patient and the degree of pigment normally present. (1 figure, 7 references)

Eugene M. Blake.

Vanysek, Jan. **Electroretinographic picture of glaucoma.** Klinika oczna **25**:235-247, 1955.

The author evaluated 352 electroretinograms made in 35 cases of glaucoma. Numerous abnormalities were found, but no definite pattern could be established. It was noticed that deviations from normal were greater than average and there were numerous combinations of deviations. Amplitude of abnormalities was not related to the severity of glaucoma. Certain abnormalities can be explained by the changes in the reactivity of the retina which are located in the synapsis of its nervous layers. (8 figures, 1 table, 14 references) Sylvan Brandon.

Weekers, R., Watillon, M., Gongnard, L. and Gustin, J. **The effect of Aleudrine (Isopropyl-noradrenalin) on the ocular tension.** Bull. Soc. belge d'opht. **111**:314-318, Nov., 1955.

Aleudrine is a sympathicomimetic amine. It is well tolerated when applied locally as a four-percent ophthalmic ointment. It causes a mild transitory congestion of the conjunctival vessels but does not change either the diameter of the pupils nor the pupillary reflexes. It reduces the ocular tension in normal eyes, in narrow and open angle glaucoma and in secondary glaucoma. Aleudrine frequently produces tachycardia and uncomfortable palpitations and therefore should not be given in the presence of hypertension, arrhythmias and myocarditis. (2 tables) Alice R. Deutsch.

10

CRYSTALLINE LENS

Alberth, B. **Results of operations for congenital and juvenile cataract.** Szemeszet **2**:82-88, 1956.

After a discussion of the literature, the course and results of 143 operations performed on 102 eyes of 70 patients are reported. Two main problems are discussed: the mode and time of operation and the dependence of these problems on the extent of the cataract. The author suggests that one allow a greater interval between the operation of the two eyes, and that one postpone operation on the second eye until the results of the first operation have become permanent. Discission, a lesser trauma, should be preferred to combined extraction of the lens. Gyula Lugossy.

Casio, G. and Ponte, F. **Cataract produced by X rays.** Rassegna ital. d'ottal. **24**:424-429, Nov.-Dec., 1955.

At the age of two years a child was given an unknown number of X-ray treatments of unknown intensity for the treatment of microsporia of the scalp. The eyes are said to have been covered adequately during treatments. At the age of six years the mother noted white spots in the pupillary area of each eye and decreasing visual acuity. There was marked alopecia and hyperpigmentation of the scalp and eyelids, with madarosis. Complete cataract was present in each eye. The author feels that the age of the patient, the severity and the irreversibility of the damage is due to the irradiation of the epithelium of the lens in a period of life when changes occur rapidly. He reviews the work done by numerous students of the lens changes induced by various rays, including the cases at Hiroshima. (1 figure, 11 references) Eugene M. Blake.

Janert, H., Mohnike, G. and Guenther, L. **Ophthalmologic studies of diabetes.** Klin. Wchnschr. **34**:724-746, July 15, 1956.

In a study of 2,600 patients with controlled diabetes, further evidence was gathered to show that the conspicuous demarcation of the outer zone of disjunction and an increased density of the pe-

ripheral suture system are clearly precursors of diabetic cataract. The frequency of early and well-developed diabetic cataract shows a positive correlation with duration of the diabetes and a negative one with the age of onset. The cataracts in diabetics older than 40 years are senile cataracts. There is a definite positive correlation between frequency of observation of these opacities and age of patient. (4 figures, 2 tables, 14 references)

F. H. Haessler.

Puender, Hermann. **Floating capsule folds in a complicated cataract.** Klin. Monatsbl. f. Augenh. **129**:98-101, 1956.

In a 24-year-old woman with bilateral cataract marked folds of the lens capsule could be seen. These folds protruded into the anterior chamber and moved freely. The shrunken cataract was extracted and the folds were seen on histologic preparations. (3 figures, 12 references)

Frederick C. Blodi.

11

RETINA AND VITREOUS

Biro, I. **Inverse crossing phenomena in the fundi of hypertonic patients.** Klin. Monatsbl. f. Augenh. **128**:672-679, 1956.

In the normal arterio-venous crossings the artery lies interior, or superficial to the vein. Inverse crossings occur when the vein lies more superficially in the retina. Such crossings could be observed in 27 out of 286 patients.

In 10 instances a small venule crossed over the artery. It was elevated but clung entirely to the bigger vessel. In three instances a large vein could be seen crossing over a small arteriole. There the behavior of the vein depended on the severity of the arteriolar sclerosis. The vein was either unchanged or highly elevated so that it touched the arteriole in only one point. The latter behavior occurred also when the artery and vein were of the same caliber. These crossing phenomena were observed only on patients with a blood pressure above 200 mm. Hg. (5 figures, 11 references)

Frederick C. Blodi.

François, J., Rabaey, Evens, L. and de Vos, E. **Histopathologic study on a case of Coats' disease, probably of toxoplasmic origin.** Bull. Soc. belge d'opht. **111**:448-463, Nov., 1955.

After an evaluation of the symptom complex referred to as Coats' disease the history of a three-year-old child is reviewed in detail. This child had a severe monocular external retinitis; because of the possibility of an intraocular growth the eyeball was removed. The histopathologic examination showed a pseudotumoral mass in the region of the posterior pole. The retina was completely destroyed. The mass consisted of dense fibrous tissue, degenerated cells, cholesterol crystals and a layer of ghost cells. In the periphery the lesions were restricted to the retina, especially to its inner layers. Here the lesions were mostly vascular, with cystic degeneration and acidophylic exudate. The dye test for toxoplasma was positive in high dilution in mother and child. No organism could be found. (8 figures, 26 references)

Alice R. Deutsch.

François, J. and De Rouk, A. **Electroretinography in retinal periphlebitis.** Bull. Soc. belge d'opht. **111**:408-413, Nov., 1955.

The patients were divided in two groups on the basis of severity of the fundus lesions. The first group comprised cases of pure periphlebitis with or without recurrent vitreous hemorrhages. Group two included cases complicated by retinitis proliferans and retinal detachment. Karpe's original method was employed; and also a slightly modified procedure with a neon stroboscope as a light source.

Eighteen patients were examined. The E.R.G. was normal as long as the periphlebitis was not complicated by either retinitis proliferans or retinal detachment. The E.R.G. became subnormal as soon as the retina began to degenerate and got worse with progression of the retinal degeneration. (3 figures)

Alice R. Deutsch.

Korsten, H. B. and Berneaud-Kötz, G. **An early stage of paraproteinemic fundus in a patient with macroglobulinemia.** Klin. Monatsbl. f. Augenh. **128**:679-686, 1956.

A 57-year-old man was seen who had macroglobulinemia combined with the appearance of paraproteins (kryoglobulines). The fundi were at first normal. Later the veins became dilated and tortuous until finally the characteristic picture of dark red, dilated veins with sausage-like constrictions developed. The discs became blurred and slightly elevated. (2 figures, 10 references)

Frederick C. Blodi.

Meyerratken, E. **Damage to the macula from watching an eclipse June 30, 1954.** Klin. Monatsbl. f. Augenh. **129**:78-87, 1956.

The scotoma helieclipticum was the most consistent finding in 12 patients. The macula recovered in most patients and the poorest permanent vision was 5/7, which is considerably better than usually stated. (4 figures, 1 table, 33 references)

Frederick C. Blodi.

Muenchow, Wolfgang. **A simple method to test macular lesions.** Klin. Monatsbl. f. Augenh. **129**:94-96, 1956.

The Amsler charts can be improvised by typing dots on white paper. (3 figures)

Frederick C. Blodi.

Popp, C. and Ehrich, W. **Shagreen of the macula and amblyopia.** Klin. Monatsbl. f. Augenh. **129**:87-93, 1956.

The macular shagreen is an entoptic phenomenon which appears on diascleral illumination. In addition to the visible retinal vessels (Purkinje phenomenon) numerous, small, light dots appear in the foveal area. In 34 amblyopic patients the results were equivocal. (1 table, 10 references)

Frederick C. Blodi.

Rossi, Antonio. **Retinopathy diabetica and the syndrome of Kimmelstiel-Wilson.** Rassegna ital. d'ottal. **24**:416-423, Nov.-Dec., 1955.

The syndrome of Kimmelstiel-Wilson consists of a pathologic change in the intercapillary glomerular capillaries and degenerative alterations of the arterioles and capillaries of the kidneys associated with diabetes mellitus. Hypertension and renal insufficiency develop. Characteristic of the process is the presence of hyaline nodules in the periphery or center of the glomerules, and at times a hyaline sclerosis in them. Numerous investigators consider the retinitis diabetica and the Kimmelstiel-Wilson symdrome as practically identical and as a common expression of a vascular disease which is the result of disordered fat and protein exchange ending in disproteinemia and hyperdislipidemia. (10 references)

Eugene M. Blake.

Solarski, Zbigniew, **Treatment of retinal periphlebitis.** Klinika Oczna **25**:267-272, 1955.

Sixteen patients with retinitis proliferans were treated by the author with streptomycin, PAS and hydrozide of nicotinic acid. In some cases improvement was apparent within two to three weeks and the cure was achieved in two or three months. In cases of longer duration, particularly where proliferation was extensive, results appeared later and the treatment was continued for as long as seven months. The average amount of hydrozide used for patients was 9 gm. (from

4 to 12 gm.) and streptomycin from 5 to 10 gm. In 60 percent of the patients definite improvement was achieved. In 15 percent improvement was only partially satisfactory and in the remaining 25 percent there was none.

Sylvan Brandon.

13

NEURO-OPHTHALMOLOGY

Berkowitz, M. **Myasthenia gravis pseudoparalytica.** Vestnik oftal. **3**:27-28, May-June, 1956.

A 49-year-old man had a sudden onset of difficulty in swallowing and chewing, change of the voice and ptosis of the right upper lid. He had paresis of both facial nerves of the peripheral type, ptosis of the right upper lid and an upshoot of the eyeball. There was increased cholinesterase in the blood. These symptoms disappeared under treatment and prolonged rest. Olga Sitchevska.

Laterza, A. and Quintieri, C. **Torticollis in oscilloptic nystagmus.** Riv. otoneuro-oftal. **30**:375-378, Sept.-Oct., 1955.

The authors discuss the case of an eight-year-old boy with torticollis, nystagmus, and oscillopsia. Although oscillopsia was described initially by Brickner in 1936 as a characteristic of the nystagmus of multiple sclerosis, this case demonstrated that this symptom is not necessarily restricted to this neurological condition. (7 references, 1 figure)

William C. Caccamise.

Stanley-Jones, D. **Physiology of tremor and nystagmus.** J. Nerv. & Ment. Dis. **122**:518-523, Dec., 1955.

This is a fascinating article in which the author uses the new science of kybernetics (cybernetics in the U.S.) to explain the purposeless or excessive muscle movements of paralysis agitans, nystagmus, shivering and trembling. The basic hypothesis is that all muscle movements are carefully controlled by negative feedback circuits in the nervous system. It is felt by the author that the basic defect in the various oscillations he considers is a time-lag introduced into the circuit. Impulses may therefore be said to be fed back "out-of-phase" so that a coordinated smooth muscular movement is impossible. The time-lag occurs because of a "long-circuiting" of the feed back impulse due to an organic or functional lesion of the normal pathway. (15 references)

David Shoch.

14

EYEBALL, ORBIT, SINUSES

Niessen, V. **Pseudotumors of the orbit on the basis of cavernous hemangiomas.** Klin. Monatsbl. f. Augenh. **128**:661-667, 1956.

Both patients were adolescent boys who had had an orbital hemangioma removed as infants. The recurring exophthalmus proved to be due to an unspecific granuloma. This was apparently the reaction of the orbital tissue to a sclerosing hemangioma. The youth of the patients is quite characteristic of this type of pseudotumor. (3 figures, 11 references)

Frederick C. Blodi.

Sebestyen, J. **Results of treatment of acute inflammations in the orbit.** Szemeszet **2**:91-95, 1956.

Fifty patients with inflammatory processes in the orbit were treated with sulfonamides and antibiotic drugs. Operation may be frequently avoided. The incidence of blindness has been reduced from 18 to 15 percent and the mortality rate from 3 to 5 percent against the rate of 18 percent before antibiotics were used. Gyula Lugossy.

Serfling, H. J. and Parnitzke, K. H. **Arterio-venous fistula in the cavernous**

sinus. Klin. Monatsbl. f. Augenh. **128**:641-657, 1956.

Seven cases were observed for 6 to 10 years. Pulsating exophthalmus and bruit were always present. The third nerve was invariably, the sixth often and the fourth occasionally affected. Trigeminal paresthesia was found in the majority of the cases. Six patients had to be treated because of the annoying bruit or because of damage to the optic nerve. Two patients were treated with a pilotte only, in the others ligation was performed (common carotid three times, common and external once, internal once). All patients were greatly improved. (8 figures, 63 references) Frederick C. Blodi.

15

EYELIDS, LACRIMAL APPARATUS

Cowan, R. J. **Reconstruction of the eyebrow by an up-and-down scalp flap.** Brit. J. Plastic Surg. **9**:43-46, April, 1956.

A new method is presented which requires extensive dissection with an up-and-down flap based on the frontal hair line of the opposite side of the forehead. This technique, shown well in a drawing, supplies an eyebrow of suitable transverse width and vertical height, and assures the survival of hair follicles. However, the scalp must be shaved, and there is a necessity of a delay, transference, and division. Photographs of the two patients on whom this method was used show that more than ample eyebrows can be obtained by this method.

Alston Callahan.

Kozlowski, Bogumil. **Author's method of repair of congenital ptosis.** Klinika Oczna **25**:255-260, 1955.

The author discusses various methods of ptosis surgery. He is particularly interested in conditions wherein the superior rectus muscle is normal. Widely accepted methods of Motais and Blascovitz have their weak points. The author devised his own method. The levator is exposed, divided into three parts, and both lateral parts are cut off from their tarsal attachment. The superior rectus muscle is then exposed and the free ends of the levator are passed under it and inserted into previously prepared pockets under the skin. The sutures are tied on beads just above the lashes. The author had good results in 23 cases which included four of traumatic paralysis of the levator. In cases of weakness of the superior rectus muscle the author prefers the Blascovitz technique. (5 figures, 8 references) Sylvan Brandon.

Wildermuth, O. and Evans, J. C. **The special problem of cancer of the eyelid.** Cancer **9**:837-841, July-Aug., 1956.

A lesion of the skin of the eyelid less than 0.5 cm. in diameter, is most easily treated by excision and primary closure. If the lesion requires sacrifice of the full substance of the lid, radiation therapy is the treatment of choice, inasmuch as loss of tissue and function will be minimal. A total of 4000 r in ten treatments within a period of 12 to 14 days has become the established technique of irradiation. (10 figures, 6 tables, 7 references)

Irwin E. Gaynon.

Wolfson, M. and Mariasis, S. **The treatment of dacryocystitis in infants.** Vestnik oftal. **3**:15-16, May-June, 1956.

The authors treated 12 infants with dacryocystitis by irrigating the sac with physiologic salt solution under pressure. This pressure was obtained by closing the upper canaliculus with a glass rod. The fluid fills the sac and tears the formed membrane at the lower end and acts like a soft probe. The advantage of this treatment is the avoidance of trauma of the mucous membrane or the formation of a false passage. Complete cure was obtained in 10 of the 12 infants; in one there was

only a partial restoration of patency of the duct and in the other no patency of the duct was obtained. The time of observation was from nine months to three years. (1 drawing) Olga Sitchevska.

17

INJURIES

Calmettes, Deodati and Amalric. **Investigations concerning a "lost" eye.** Bull. Soc. belge d'opht. **111**:311-314, Nov., 1955.

A 34-year-old woman was violently hit over her right forehead and orbit by the horns of a steer. She did not loose consciousness or show any external evidence of injury except that she had a right enophthalmos. Routine X-ray studies were negative. She was fitted with an artificial eye which was well tolerated. The X-ray studies were repeated after several years and they were again essentially normal. Frontal tomographies of 5-6 cm. however revealed a defect of the orbital floor and the presence of an ovoid mass connected with this defect. Lipiodol injections of the sinus confirmed these findings, namely the luxation of the right globe into the antrum. An incision along the inferior orbital margin disclosed an intact optic nerve and an atrophic eyeball.

The medico-legal implications of similar cases are discussed and the significance of tomography in orbital and fascial traumatism are recognized. (1 figure)
Alice R. Deutsch.

18

SYSTEMIC DISEASE AND PARASITES

Büttner-Wobst, Wolf. **The diagnostic value of a fundus examination in congenital lues.** Klin. Monatsbl. f. Augenh. **128**: 710-715, 1956.

Ninety-nine children of luetic mothers were examined. In five children definite fundus changes were observed (four times a pepper and salt fundus and once a luetic choroiditis). (2 figures, 6 references)
Frederick C. Blodi.

Fornaro, L. **Endocrine exophthalmos.** Riv. oto-neuro-oftal. **30**:427-458, Sept.-Oct., 1955.

Endocrine exophthalmos is discussed in detail. The author concludes that exophthalmos is frequently independent of a hyperfunction of the thyroid but is constantly related to an increase in circulating TSH. (52 references, 3 figures)
William C. Caccamise.

Salgado Gomez, Fernando. **The ocular manifestations of acrodynia.** Arch. Soc. oftal. hispano-am. **16**:163-170, Feb., 1956.

The author reports a case of Pink disease, in a five-year-old child, whose ocular symptoms were photophobia, lacrimation and blepharospasm. The child developed these symptoms after therapy for intestinal parasites. A general examination revealed that the child had Pink disease. The literature is reviewed, and the pathogenesis of the ocular symptoms discussed. The author believes that the photophobia is caused by diencephalic changes with an excitation of the sympathetic, and the lacrimation is a manifestation of the reaction of the parasympathetic to the excitation of the sympathetic. (2 figures, 12 references) Ray K. Daily.

Shershevskaya, O. **Ophthalmologic manifestations in thyreotoxicosis.** Vestnik oftal. **4**:16-20, July-Aug., 1956.

Shershevskaya observed a stubborn, recurrent spasm of the accommodation with lenticular astigmatism and asthenopia in six patients with thyreotoxicosis. Atropinization produced only a temporary effect. The spasm was eliminated only after treatment of the thyreotoxicosis by small doses of iodine (under the observation of an endocrinologist). There was not only dilation and pulsation of the retinal arteries, but also dilation of the

retinal veins (in 12 out of 60 patients). Three patients had edema of the peripapillar and macular regions, cotton-wool patches and hemorrhages in the retina. The latter were ascribed to vascular dystony and lack of vitamin C. In 12 patients the systolic pressure in the central artery of the retina was above 75 mm. and the diastolic above 55 mm.; in two patients it was hypotonic, in 16 it was normal. Allergic reactions were common. Severe, recurrent eczema of the lids caused by the use of atropin in uveitis, was alleviated by microdoses of iodine.

Olga Sitchevska.

Siegert, P. **Ocular diseases in undernourished repatriated prisoners of war.** Klin. Monatsbl. f. Augenh. **129**:3-13, 1956.

The ocular findings in German prisoners of war who had spent many years in camps are reviewed. Most frequent (six percent of the patients) were edema and depigmentation in the macula. "Camp amblyopia" was only found in prisoners who spent a long time in tropical or subtropical areas. Impaired dark adaptation was found in a comparatively small percentage. (1 figure, 32 references)

Frederick C. Blodi.

19

CONGENITAL DEFORMITIES, HEREDITY

Albrectsen, B. and Svendsen, I. B. **Hypotrichosis, syndactyly and retinal degeneration in two siblings.** Acta dermat.-venerol. **36**:96-101, 1956.

A girl, aged 6, and her brother, aged 4, were found to have similar congenital anomalies. There was baldness, pyknic tendency, webbing of the middle fingers and toes, and broad fork-like hands with short or defective finger bones. Visual acuity was between 6/24 and 6/60 corrected with glasses. The girl had alternating convergent strabismus. Both had a peculiar retinal pigmentary disturbance which could have been from a choroiditis, but which in places also resembled grouped pigmentation and was considered degenerative.

The parents were first cousins, and the paternal uncle had a hand deformity with webbing, strabismus, and pes varus. Of 69 living members of the family, 28 were interviewed. (2 figures, 7 references)

Paul W. Miles.

Brihaye, M. and Danis, P. **Association of ocular and visceral malformation. (An anatomical and clinical study of retinal dysplasia.)** Bull. Soc. belge d'opht. **111**: 381-390, Nov., 1956.

The classification of congenital ocular malformations is very difficult because a variety of congenital abnormalities may be based on one and the same causative agent and a single congenital malformation may be based on various causative factors. Studies of congenital malformations therefore only are of real value if pathologic investigations can be added to support the clinical examinations and the anamnestic details.

The case of a six-weeks-old infant with extreme bilateral microphthalmos, progeria and congenital heart disease is discussed. The pathologic examination confirmed the diagnosis of complete retinal dysplasia and placed the unidentified pathogenic agent between the first and second month of pregnancy. This early period of disturbed organogenesis was sustained by malformations of the heart, skeleton and cerebellum. (5 figures, 37 references)

Alice R. Deutsch.

François, J. **A new heredo-generative familial corneal dystrophy.** Bull. Soc. belge d'opht. **111**:391-399, Nov., 1955.

A newly recognized corneal dystrophy is described. The opacities consisted of a disc, located in the posterior third of the cornea. The disc contained many gray-

ish, fine, flaky dots and was not sharply outlined but faded gradually towards the anterior layers and towards the limbus. Occasionally the cloudiness reached Bowman's membrane. Visual disturbances were rare. It is very probable that this corneal abnormality is more frequent than it seems as it might easily be either incorrectly diagnosed or overlooked. Eight case histories and pedigrees are exhibited. (7 figures, 2 references)

Alice R. Deutsch.

Fülling, G. and Pünder, H. **Fundus changes in the status Bonnevie-Ullrich.** Klin. Monatsbl. f. Augenh. **128**:724-727, 1956.

A two-and-one-half-year-old girl with lymphangiectatic edema, dwarfism, microcephaly and aural deformities is described. The ophthalmic examination revealed pigment changes at the equator of the fundus, hyperopic astigmatism, esotropia and epicanthus. (2 figures, 6 references)

Frederick C. Blodi.

Unger, H. H., Bork, U. and Marget W. **Sixth nerve palsy in kernicterus.** Klin. Monatsbl. f. Augenh. **128**:657-661, 1956.

Two Rh positive infants of Rh negative mothers were observed with a congenital abducens paresis. It was bilateral in one and unilateral in the other infant. It is suggested that a number of congenital extraocular palsies may be caused by some form of erythroblastosis. (9 references)

Frederick C. Blodi.

Kjer, Poul. **Hereditary infantile optic atrophy with dominant transmission.** Danish Med. Bull. **3**:135-140, Aug., 1956.

Hereditary optic atrophy may be classified in two types, those associated with a generalized syndrome, and those which are isolated. The first group includes Friedreich's ataxia, Pierre-Marie's ataxia, amaurotic idiocy, Behr's disease, and Laurence-Moon-Biedl syndrome. The second group includes Leber's disease (the most common), recessive congenital, and dominant. The dominant type of optic atrophy may be either congenital or infantile. The patients reported here were of this last type, except that the onset occurred at school age.

The author studied 20 Danish families. Of 650 persons examined, 450 were normal, and 200 had optic atrophy. In addition there were 39 unexamined persons in whom optic atrophy seemed quite certain and 10 in whom it was probable. There were 116 men in the series, 19 boys, 100 women, and 14 girls. No case was discovered in infancy. The visual acuity in the majority was between 6/18 and 6/60; none saw less than hand movements. The vision was usually equal bilaterally. The discs showed pallor, usually of the temporal half, cupping, sharp edges, and frequently a sickle shaped, temporal, choroidal atrophy. A few patients had slight pigmentary macular changes. Vision continued to fail throughout life. There was no nystagmus. Visual fields showed paracentral scotomas frequently connected with the blind spot. The defect resembled that in tobacco amblyopia, except that red targets were much better seen than blue. About 50 percent of children of two effected parents had the disease. The transmission was autosomal. (11 figures, 2 tables, 23 references) Paul W. Miles.

Landau, J., Nelken, E. and Davis, E. **Hereditary haemorrhagic telangiectasia with retinal and conjunctival lesions.** Lancet **2**:230-231, Aug. 4, 1956.

The authors describe a family in which various manifestations of hereditary hemorrhagic telangiectasia (Osler's disease) were displayed by several members. A pedigree of five generations shows a clear relationship. Two sisters had conjunctival telangiectasis, there were varicose retinal veins in three sisters, three

members had cavernous nevi and four members were microcephalic idiots with Little's disease. (6 figures, 14 references)

F. H. Haessler.

Sédan, Jean. **Anophthalmos in nephroectopic pigs.** Ann. d'ocul. **189**:392-401, April, 1956.

The combination of congenital anophthalmos and ectopia of the kidney is said to occur in about one out of every 10,000 pigs, but not in cattle or sheep. Etiologic factors cited are consanguinity and maternal hypovitaminosis, the former being the more plausible. Changes in breeding methods may be causing a decrease in incidence. In nine cases studied by the author, the globes were represented merely by pigmented streaks and the optic nerves were more differentiated fibrous tracts. The orbits were slightly smaller than normal. The lids and lacrimal glands were normal. Although the kidneys were grossly deformed (horse-shoe shaped or multilobed), they were histologically and functionally normal. Anophthalmos without renal anomalies has not been described, but ectopia of the kidneys may occur with normal eyes. (6 figures, 34 references)

John C. Locke.

20

HYGIENE, SOCIOLOGY, EDUCATION, AND HISTORY

Feigenbaum, Aryeh. **Description of Behçet's syndrome in the Hippocratic third book of endemic diseases.** Brit. J. Ophth. **40**:355-357, June, 1956.

The possible identification of a disease endemic to ancient Greece with a sporadic case of Behçet's disease is well outlined on the basis of translations from the Hippocratic writings. The ancient writings describe the aphthous stomatitis, ulcers about the genitals and recurrent uveitis. Only one finding as described in the ancient writings does not fit into the picture and that is the "growths on the exterior of the lids." (7 references)

Lawrence L. Garner.

NEWS ITEMS

Edited by DONALD J. LYLE, M.D.
411 Oak Street, Cincinnati 10, Ohio

News items should reach the editor by the 12th of the month. For adequate publicity, notices of postgraduate courses and meetings should be received three months in advance.

DEATHS

Dr. Irving Francis Barnett, Chicago, Illinois, died June 26, 1956, aged 64 years.

Dr. Robert Hull Courtney, Richmond, Virginia, died May 23, 1956, aged 63 years.

Dr. Charles Gilchrist Darling, Evanston, Illinois, died August 8, 1956, aged 78 years.

Dr. Arthur Varney Garlock, Bemidji, Minnesota, died June 25, 1956, aged 71 years.

Dr. Francis Edward Mallon, Brooklyn, New York, died June 24, 1956, aged 61 years.

Dr. James Devote Perdue, Mobile, Alabama, died May 18, 1956, aged 67 years.

Dr. Robert Russell Tracht, St. Paul, Minnesota, died May 25, 1956, aged 56 years.

ANNOUNCEMENTS

URGENT REQUEST

The Uveitis Laboratory, University of California School of Medicine, San Francisco, is anxious to obtain freshly enucleated eyes from patients with *all types of uveitis* and endogenous uveitis. We are making attempts to isolate viruses and other etiologic agents from these eyes. We are also interested in pathologic studies to aid in identification of any agents. In addition to eyes with the usual types of uveitis we are interested in those which develop intraocular inflammations as a result of sclerosing keratitis, herpes febrilis and zoster of the cornea, mycotic corneal infections, glaucoma secondary to endogenous uveitis, Coats' disease, Eales' disease, papillitis and scleritis. The eye tissues will be cultured in various media.

The eyes should *not* be fixed in preservatives or frozen, but placed in a sterile bottle, packaged, and shipped as quickly as possible. Please send the specimens air express, special delivery, *collect*. Enclose history and findings and mark the package "Fresh Tissue Specimen—Rush."

A report of isolations of organisms and pathologic findings, including a slide, will be sent to the contributor, and credit will be given in any resulting publications if desired.

Please telegraph collect if a specimen is being sent. Send eyes to Samuel J. Kimura, M.D., Michael J. Hogan, M.D., or Phillips Thygeson, M.D., University of California School of Medicine, San Francisco 22.

WESTERN RESEARCH

The annual meeting of the Western Section of the Association for Research in Ophthalmology will be held on Monday, January 28, and Tuesday, January 29, 1957, at the Stanford University Medical School, 2340 Clay Street, San Francisco.

NEW ORLEANS GLAUCOMA SYMPOSIUM

The midwinter convention of the New Orleans Academy of Ophthalmology to be held at New Orleans on February 11 through 15, 1957, will feature a symposium on glaucoma. On the panel will be Dr. Bernard Becker, Dr. W. Morton Grant, Dr. Joseph S. Haas, Dr. A. E. Maumenee, Dr. Harold G. Scheie, Dr. Kenneth C. Swan, and Dr. Georgiana D. Theobald.

Specific subjects to be discussed during the symposium are: "Anatomy and histology," "Physiology and basic tonography," "Chemistry and aqueous flow," "Gonioscopy and classification," "Pathology," "Diagnosis and provocative tests," "Clinical tonography," "Provocative tests and tonography," "Clinical pictures and fields," "Medical therapy," "What is good medical control?", "Surgical therapy," "Illustrative cases: Congenital; Narrow-angle; Open angle."

The registration fee of $75.00 includes associate membership in the academy for 1957, as well as all other features of the convention. Hotel reservations should be made early by writing to the Roosevelt Hotel, 123 Baronne Street, or to the executive secretary, P.O. Box 469, New Orleans, Louisiana.

IRISH OPHTHALMOLOGICAL SOCIETY

The 1957 meeting of the Irish Ophthalmological Society will be held jointly with the British Society of Neurological Surgeons on May 15 through May 18, 1957, at Dublin, Ireland. Among the speakers will be Dr. Max Chamlin of New York, and Dr. Frank B. Walsh, of Baltimore, Maryland, who will deliver the Montgomery Lecture.

FLORIDA MIDWINTER SEMINAR

The University of Florida Midwinter Seminar in Ophthalmology and Otolaryngology will be held at the Seville Hotel, Miami Beach, Florida, January 14 to 19, 1957. Further information may be obtained from:

Dr. Walter T. Hotchkiss
541 Lincoln Road
Miami Beach, Florida

GILL SPRING CONGRESS

The Gill Memorial Eye, Ear, and Throat Hospital, Roanoke, Virginia, will hold its 30th Annual Spring Congress in Ophthalmology and Otolaryngology and allied specialties, April 1 through April

6, 1957.

Among the guest speakers will be: Dr. David B. Allman, Atlantic City, New Jersey; Dr. Seymour Alpert, Washington, D.C.; Dr. Edward A. Carr, Jr., Ann Arbor, Michigan; Dr. James H. Doggart, London, England; Dr. Harold F. Falls, Ann Arbor, Michigan; Dr. Frederick A. Figi, Rochester, Minnesota; Dr. Samuel Fomon, New York, New York; Dr. Dan M. Gordon, New York, New York; Dr. Maynard K. Hine, Indianapolis, Indiana; Dr. Howard P. House, Los Angeles, California; Dr. Jay G. Linn, Jr., Pittsburgh, Pennsylvania; Dr. Frank W. Newell, Chicago, Illinois; Dr. Hugh L. Ormsby, Toronto, Ontario, Canada; Dr. Albert D. Ruedemann, Detroit, Michigan; Dr. Harry L. Rogers, Philadelphia, Pennsylvania; Dr. Frank B. Walsh, Baltimore, Maryland; Dr. Barnes Woodhall, Durham, North Carolina.

Clinical program funds

The Public Health Service's National Institute of Neurological Diseases and Blindness has announced that funds are being made available to medical schools to strengthen existing clinical programs in advanced training in ophthalmologic and otologic diseases. The purpose is to stimulate the interest of more young physicians and scientists in careers as teachers and investigators in this field.

Training grants also are available to basic science departments to expand postdoctoral training programs in the neurologic sciences.

Further information, together with application forms, may be obtained from the Chief, Extramural Programs, National Institute of Neurological Diseases and Blindness, National Institutes of Health, Bethesda 14, Maryland.

Societies

Nassau society

The Nassau (County) Ophthalmological Society met on September 24th at Freeport, New York. Dr. Harold G. Scheie, Philadelphia, spoke on "Intracapsular cataract extraction." The next meeting of the society will be on November 26th.

District of Columbia officers

Officers of the Section on Ophthalmology of the Medical Society of the District of Columbia are: Dr. Robert E. Duprey, president; Dr. M. Noel Stow, vice-president; Dr. Marshall M. Parks, secretary-treasurer; Dr. William D. Foote and Dr. Walter J. Romejko, members of the executive committee. Meetings are scheduled for October 30 and December 6, 1956, and February 12 and April 9, 1957.

Trachoma meetings: 1956

The meetings of three organizations dedicated to the struggle against trachoma took place in April and May of this year.

I. Meeting of the *International Organization Against Trachoma*, Madrid, April 26, 1956:

This organization held a meeting at University City in Madrid on April 26th in connection with the Second Congress of the Latin Society of Ophthalmology and under the honorary chairmanship of Prof. Buenaventura Carreras-Duran, director of the eye clinic of the University of Madrid and president of the Second Congress, and of M. Bonne, director of the Division of Services for Communicable Diseases of the World Health Organization.

After the address of Prof. G. B. Bietti, director of the eye clinic of the University of Rome, as president, and the report of the secretary-general, Jean Sedan, papers were presented by Prof. Martin-Amat (Madrid), Poleff (Rabat), Ferraris de Gaspare (Rome and Hofuf A.S.), Jean Sedan (Marseille), A. Milano (Naples), Emilio Gil del Rio (Vitoria), and B. Boles-Carenini and A. Cambiaggi (Cagliari). These papers were discussed by Drs. Pages (Rabat), Sohby (Cairo), Jean Sedan (Marseille), G. B. Bietti (Rome), Maxwell-Lyons (World Health Organization, Geneva), Mabrouk (Tunis), and Marin-Amat (Madrid).

The International Organization Against Trachoma will hold its next meeting in Brussels in 1958 at the time of the International Congress of Ophthalmology.

II. Meeting of the *Trachoma Discussion Group of Paris*, May 5, 1956:

The meeting of the Trachoma Discussion Group was called on May 5th at the home President Bailliart by the secretary-general of the League Against Trachoma, Jean Sedan. The subject for discussion was "The duration of treatment in trachoma."

The participants in the discussion were Prof. G. B. Bietti (Rome), Pages (Rabat), Roger Nataf (Tunis), Rheinhards (World Health Organization, Geneva), Svetozar Postic (Novi-Sad, Yugoslavia), Jeandelize (Nancy), Olga Litricin (Belgrade), Stankovic (Belgrade), Jean Sedan (Marseille), Eddie Mawas (Paris), Chalvignac (Marrakech), and Maggiore (Genes).

It was concluded that after a three-week to three-month period of regular, controlled treatment, cures may be estimated but that all cases should be observed over a period of years.

The theme chosen for next year's meeting was: "What should be the role of the old-time, classical methods of treating trachoma? Should they or should they not be combined with present-day methods?"

III. The general assembly of the *League Against Trachoma*, Paris, May 7, 1956:

The general assembly, with an important attendance representing 14 nations, met in the Centre Marcellin-Berthelot which had been most graciously placed at its disposal, as it is every year, by the French Ophthalmological Society. The title of honorary president was conferred successively

on Prof. Luigi Maggiore of Genes and on Dr. Emmanuel Cornet of Paris.

After the address of the president, P. Bailliart, and the report of the secretary-general, Jean Sedan, the assembly voted to award the Medaille d'Or Chibret, with its purse of 200,000 francs, to Prof. Mario Giaquinto of the Communicable Disease Service of the World Health Organization, with an expression of gratitude to the organization itself. It then voted to award the Bourse d' Etudes Chauvin-Blache to Dr. Sohrab Darougar (200,000 francs), an attaché of the Research Department of the faculty of Tehran.

A discussion of the report of Roger Besnainou of Tunis on "The surgery of trichiasis" was then undertaken. Participating successively in this discussion were Prof. Jean Charamis (Athens), Prof. Toulant (Algiers), Prof. Larmande (Algiers), Prof. G. B. Bietti (Rome), Prof. Stankovic (Belgrade), M. Pages (Rabat), Hadi-Rais (Tunis), Svetozar Postic (Novi-Sad), Eddie Mawas (Paris), Jacques Mawas (Paris), Archimede Busacca (São Paulo), Roger Nataf (Tunis), and Rheinards (World Health Organization, Geneva).

Free papers were then presented by Emmanuel Cornet (Paris), Jean Peyreblanques (Dax), Roger Nataf (Tunis), Rohrschneider (Munich), Jean Sedan (Marseille), François Malnou (Tozeur), Stany Habachi (Le Caire), Mabrouk et Maiza (Tunis), Svetozar Postic (Novi-Sad), Olga Litricin and Milivoje Radovanovic (Belgrade), Jean Charamis and Georges Tacticos (Athens), and Pages and Gouray (Rabat).

The general assembly then agreed that the next reports to be presented to the league would be as follows:

1957—Prof. Jean Charamis (Athens): "Trachoma and the lacrimal apparatus."

1958—P. Thygeson (U.S.A.) and Roger Nataf (Tunis): "The problem of the etiology of trachoma."

1959—Prof. Marin-Amat (Madrid): "The influence of trachoma on therapeutic indications in eye diseases."

Central Illinois meeting

At the 27th convention of the Central Illinois Society of Ophthalmology and Otolaryngology held recently in Springfield, Illinois, Dr. Harvey E. Thorpe, Pittsburgh, spoke on "Use of Diamox in ophthalmology," "Differential diagnosis of cataract in adults," and "Retinal detachments." Officers of the society are: President, Dr. Walter E. Owen, Peoria; president-elect, Dr. Edward C. Albers, Champaign; vice-president, Dr. William A. McNichols, Dixon; secretary-treasurer, Dr. Clarence A. Fleischli, Springfield.

Personals

Dr. Walter H. Fink, Minneapolis, and Dr. R. Townley Paton, New York, will represent ophthalmology as honor guests at the annual spring clinical conference of the Dallas Southern Medical Society, to be held at Dallas, Texas, March 18 through 20, 1957.

Dr. Lorenz E. Zimmerman, chief, Ophthalmic Pathology Section, Armed Forces Institute of Pathology, was an instructor in pathology of the eye at the Lancaster Courses in Ophthalmology held at Colby College, Waterville, Maine, during the summer.

Dr. Gerald Fonda, Short Hills, New Jersey, and Dr. Charles L. Schepens, Boston, spoke during the American Optical Company's series of conferences on Visual Optics and Refraction held at Southbridge, Massachusetts, November 12th to 14th.

Dr. William A. Mann, Chicago, is chairman of the panel on ophthalmology for the *United States Pharmacopeia XVI*. Other members of the panel are: Dr. Derrick Vail, Chicago; Dr. Kenneth C. Swan, Portland, Oregon; Dr. Peter C. Kronfeld, Chicago; Dr. James H. Allen, New Orleans; and Dr. Irving H. Leopold, Philadelphia.

The appointment of Dr. John S. McGavic as professor of ophthalmology, Temple University Medical Center, has been announced by Dr. Glen Gregory Gibson, professor and head of the department. Dr. McGavic is also professor of clinical ophthalmology at the University of Pennsylvania Graduate School of Medicine and is in charge of the eye service at the Bryn Mawr Hospital.

Dr. Frederick C. Cordes of San Francisco has been elected a Regent of the American College of Surgeons.

Dr. John H. Dunnington, New York, will deliver the 11th Francis I. Proctor Lecture at the University of California School of Medicine on Friday evening, December 7th.

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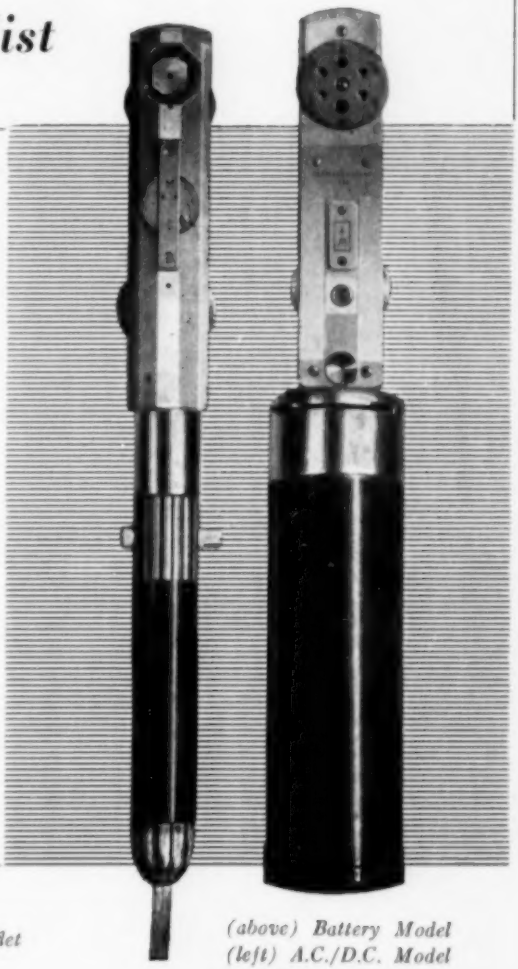

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